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CONTENTS

		Page
ARTIFICIAL INSEMINATION AND ITS POSSIBILITIES IN WESTERN AUSTRALIA	M. Cullity	89
RATE OF MILKING WITH MACHINES	M. Cullity	99
BETTER DAIRYING COMPETITION, 1949–50—NOTICE		104
ALBANY AGRICULTURAL AND HORTICULTURAL SOCIETY PASTURE AND MEADOW HAY COMPETITIONS 1948–49	C. W. Tobin	106
BACONER CARCASS COMPETITION—NOTICE		108
THE RUNT AND ITS PLACE IN PIG HUSBANDRY	V. B. Monti	110
CLOVER DISEASE	F. L. Shier and R. C. Rossiter	111
BACONER CARCASS COMPETITION	M. Cullity	117
BETTER DAIRYING COMPETITION, 1948–49	M. Cullity	131
ANALYSIS OF FEEDING STUFFS		165

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ARTIFICIAL INSEMINATION AND ITS POSSIBILITIES FOR HERD IMPROVEMENT IN WESTERN AUSTRALIA

M. CULLITY, Superintendent of Dairying. *

ARTIFICIAL insemination is not something new. There are records of mares being inseminated by the Arabs in this way five or six hundred years ago. It has become of wide interest only in the current century and particularly in the last decade. It was the work of Professor Eli Ivanov, a Russian Scientist in showing that sperm could be preserved at low temperatures that gave an impetus to the practice. When scientific methods of obtaining and storing semen were developed, the possibilities of artificial insemination in obviating the keeping of a bull and as a means of herd improvement became widely appreciated.

Artificial insemination is not a very good term, as it suggests something that is divorced from nature. It is, of course, merely a method of directing nature to obtain results which nature unassisted could give. It has been suggested that a better term would be " selective breeding," as it is a method by which the widest use of selected males may be achieved.

The credit for focussing attention on its possibilities must be given to Russian Scientists who began using it on a commercial scale with mares about 1910. They trained inseminators to practise in the field. It was reported that 3,400 mares were treated in 1912 and that a 41% foaling was achieved. Little further work was done during World War I, and it was not until the early 1920's that it was again seriously revived.

By 1928 it was reported that 70,000 mares were being handled.

Work with cattle was commenced about this time. In 1930 nearly 20,000 cows had been inseminated. In 1931 the number had risen to 183,000 and in 1932 to 385,000. Very rapid expansion continued, and in 1937 and 1938, 1,000,000 and 1,500,000 were reported to have been stocked by this method. The latter number represented about five per cent. of all Russian cows.

* Presidential address Society of Dairy Technology, 1948,

Prior to the outbreak of war in 1939, artificial insemination was being used in several European countries, including Denmark, Holland and England.

Demonstrations with its use with mares had been carried out at American Experiment Stations for about 30 years, but it was not until 1938 that the first Association for breeding dairy cattle was commenced. By 1943, there were 99 Associations using 574 bulls breeding to 182,524 cows and in 1945 there were 185 Associations giving this breeding service to 42,020 herds having 342,012 cows.

In Denmark where in 1939 there were 45 Associations inseminating 72,000 cows, the number had risen by 1945 to 96 Associations, using over 600 bulls for more than 400,000 cows.

In England the Ministry of Agriculture in 1942 set up two large scale experimental centres at Reading and Cambridge. Other subsidiary centres have been established and rapid expansion is taking place. In the year ended 31st March, 1947, over 60,000 cows had been inseminated from 69 bulls.

Value in Small Herds.

Why has this practice spread so rapidly ? I have the authority of Dr. John Hammond and others for my belief that it has been the problem of keeping a good bull in a small herd which has stimulated interest in England.

Figures given in a small publication " The Artificial Insemination of Cattle " show that in the counties of Cambridge and Glamorgan the vast proportion of the herds are under 20 cows and most do not include a bull. Thus, in Cambridge, of 2,160 herds, 2,017 had under 20 cows and 1,637 were without a bull. Of the 43 herds over 20 cows, all but eight kept their own bulls. In Glamorgan the position is similar. In the introduction to the booklet, it is pointed out " If all food had to be purchased at present prices, it would cost £50 to keep even a very ordinary bull today, and where the herd consists of 10 cows this would mean £5 per cow got in calf. On small farms even where the produce is home-grown, it will be more economical to have cows artificially inseminated at 25s. per cow, and in place of the bull keep another cow. The profits from keeping another cow will more than pay all the fees for insemination in the herd.

" Quite apart from the cost of keeping a bull, the cost of buying a high class dairy bull today for use in a small herd is prohibitive, and this probably explains why the small farmer does not keep a better bull, and why, in consequence, the general level of our dairy cattle is so poor, for over half our dairy heifers are bred in these small herds."

Thus it would seem that the major incentive to the spread of artificial insemination in England has been the difficulty experienced by owners of small herds—*firstly,* in getting their cows stocked, and, *secondly,* in having them stocked to good bulls. There is reason to believe that this position has been a major reason for its rapid adoption in other countries.

Ward, Director of Herd Improvement, New Zealand, in his report to the New Zealand Dairy Board in 1946—after describing the organisation in the United States—said "While the foregoing is a general description of the type of organisation, it is quite clear that the dominating factor in the expansion of artificial insemination is the reduction in bull costs which it affords the small dairy farmer."

While there are a large number of small herds in West Australia and other parts of Australia and New Zealand, it is most improbable that this factor alone will lead to the organisation of extensive insemination schemes.

The rapid development which has taken place in these countries would not have been possible if the small farmer could not have owned a bull.

Factors Influencing Herd Averages.

Fortunately the Government and stud breeders have appreciated the need for a progressive policy in raising large numbers of bulls from lines of cattle bred for production, for use in the low quality herds originally existing. Consequently there has been a steady improvement in average yields. For example, in this State there has been a rise in average production per cow since 1920 of approximately 150 gallons of milk and 60 lb. of butter fat.

In New Zealand the improvement has been of the same order, but West Australia now only has reached the position where New Zealand was 25 years ago.

There is every reason to believe that by continuing the same policies we should repeat their performance by getting a further increase in yields. It may be expected that we would profit from their experience and progress a little faster.

Some data which has been accumulated in New Zealand is of interest.

A Committee appointed to report on possible further improvement and to submit a Herd Improvement Plan stated—after an examination of average yields over a period of years— " The inescapable conclusion is that the rate of herd improvement has been slowing down rather than accelerating as one would have hoped in view of the rise in herd testing, etc. Improvement in the decade, 1919–1929, was more than twice as rapid as in the period 1929–39, and per cow production is now almost stationary."

They then proceeded to examine the factors which had been responsible for the improvement of 61 lb. of butter fat since 1920, and after a thorough survey of all available data, came to the conclusion that the following factors had concontributed.

	Estimated Share of Improvement.	%
Selection of daughters from highest producing dams	2 lb.	3.3
Elimination of low producers	8 lb.	13.1
Change in Breed Composition	16 lb.	26.2
Improvement in plane of nutrition increase length of lactation, etc.	35 lb.	57.4
	61 lb.	100%

It is surprising that only 10 lb. or 16 per cent. of the improvement achieved in over 20 years was attributed to the selection of the daughters from the best cows and to the elimination of the low producers.

In passing it is of interest to note that 16 lb. or 26.2 per cent. of the improvement was placed to the credit of a breed change. Since 1920, the percentage of Jerseys had increased from 27.5 per cent. to 75 per cent., while Shorthorns had decreased from 58 per cent. to eight per cent. As Jerseys were producing 15 per cent. more butter fat than Shorthorns, the overall improvement can be understood.

By far the greatest factor contributing to the increase in production was improvement in herd management apart from breeding and selection. Better feeding, longer lactations, calving at the best time, together were assessed as being responsible for 57·4 per cent. of the improvement.

The feature that is most significant is the fact that the rate of improvement achieved by the selection of heifers from the best cows was very slow. This is quite easily understood when we examine figures submitted by Ward, based on calving data in the 1940–41 and 1941–42 seasons. He demonstrated that in the average herd a large proportion of heifers from below average cows must be kept to replace normal wastage.

If the herd is being increased in size to meet gradual development of more pastures, as is the case frequently in this State, a greater proportion of below average heifers would be kept.

Thus it must be appreciated that furthur improvement in yields by the selection of daughters of the best cows would be a slow process.

The use of pure bred sires has assisted in speeding up the process in the early stages. The " grading up " of herds by using standard bulls from strains of cows having higher yields than the mates of the sires has been proved effective in lifting yields. It is well-known, however, that this method is best adapted to the improvement of mediocre or scrub herds. As the quality of the herds improve, so the rate of improvement—simply by using bulls of standard type selected on blood lines and ancestral yield data—gradually slows down. Data collected by Ward and others has shown clearly that this is so. An examination of sire surveys made in the herd recording scheme showed that only 23 per cent. of the bulls in New Zealand were improving their progeny ; 22 per cent. were maintaining while 55 per cent. were actually lowering production.

The data has been sorted according to average production of the mates of each bull. Of those mated to cows averaging under 260 lb. butter fat, 51 per cent. were improving, 31 per cent. maintaining, and 18 per cent. reducing production. In the better herds, the position was greatly different. In those yielding over 400 lb. per cow, only five per cent. were improving, 12 per cent. were maintaining, while 83 per cent. were actually lowering averages.

Between these extremes there is a gradual movement. As the average yield of the cows increased, the number of successful bulls decreased, and the number of unsuccessful ones increased.

There is a well recognised phenomenon known as " regression " to breed average. It is a tendency for the progeny of high producing stock to revert towards the average for the breed. If this " regression " did not occur, breeding for production would be relatively easy. One would need only to select sires from high-producing cows and mate them to good cows and to continue gradually building up yields to higher and higher levels. However, all breeders of stud cattle know that this does not occur, except under very careful conditions of selection and breeding, and even then there is a limit beyond which it is increasingly difficult to go.

Thus it is easy to visualise that *a more rapid improvement of yields could be achieved only if those few bulls capable of improving the progeny of high-producing cows could be used over a larger number of cows.* Herein lies the attraction of Artificial Insemination as a means of herd improvement. It is apparent that sires which prove their worth by the performances of their progeny are not easy to locate. Hence when they are found, there must be interest in endeavouring to have them used as widely as possible.

This I suggest is the major justification for considering Artificial Insemination in West Australia. The farms are large enough for the great majority of farmers to hold their own bulls. Hence artificial insemination as a means of eliminating

the farm bulls is unnecessary, but it would be worth while if the few very good bulls—proved by their progeny to be capable of transmitting high productive capacity—could be spread over a large number of cows.

Misconceptions.

There are various misconceptions, however, which should be removed. Reference has been made to the tendency to regress towards breeds average. This can and does occur with bulls used for artificial insemination in exactly the same way as in natural mating. Hence the most important single factor in artificial insemination organisation is the selection of bulls. They must have constitution and breed type, be free of disease, and have been " proved " through their daughters.

If there is one certain way to damn the possibilities inherent in artificial insemination it would be the use of mediocre bulls. It must be emphasised that artificial insemination can do nothing that natural mating will not do, other than to service a greater number of cows. It cannot usher in a millennium, but, if used in an intelligent manner in accordance with the best experience and conclusions, it can be of the greatest value.

It is necessary to emphasise also that even the selection and use of proven bulls will not lead to higher productions, unless management and particularly feeding, is of a satisfactory level. It is notorious that *the most important factor limiting production is the level of nutrition.* We see the effect from season to season due to variation in the condition of our pastures. *Artificial insemination will not overcome the limitations of under-feeding.* Probably the most effective method of lifting our production rapidly would be better feeding of our cows.

Advantages.

There are certain advantages in artificial insemination. It relieves dairy farmers of the obligation of keeping bulls. While it has been suggested that this is an insufficient reason by itself for artificial insemination, there is no doubt that the lifting of this responsibilty would be gladly accepted. Apart from the need for special yards, paddocks and shelters, there is always danger in handling these animals. Their elimination from the farm, therefore, would be welcome. Further, in a properly organised scheme the ordinary farmer would have the opportunity of having his cows inseminated from bulls of higher quality than he could afford to purchase with his own resources.

By not having to keep a bull the farmer can milk at least one extra cow, and over a large number of properties this would result in an appreciable increase in output.

Some disease is spread by bulls, consequently the elimination of their use could mean a reduction in the incidence of certain diseases including those affecting the fertility of the cows. As it is desirable that artificial insemination be under veterinary supervision and for the technicians employed to have some training in the recognition of disorders affecting conception, the loss incurred by farmers could be reduced.

Probably one of the greatest advantages, however, would be the creation of greater interest amongst farmers in better breeding methods. The bulls used would be open to inspection and their pedigrees and records of performances would be made available to all.

Disadvantages.

It is not possible to draw attention to very many disadvantages. There are many difficulties in organising a satisfactory scheme, but from the farmer's point

of view it may be suggested the only real disability is that he is obliged to communicate with the Centre whenever his cows are in season and he has to arrange for the cows to be available for attention on the arrival of the technician.

While I have proceeded on the assumption that the "centre" bulls would be satisfactory, having been proved getters of high yielding daughters, objections might still be met from those desiring to follow certain blood lines particularly for pedigree cows. They may desire their cows inseminated from a particular bull. As in usual practice the bulls are used once weekly only and the diluted fluids are reliable for a period less than one week, there will be times when cows cannot be treated from chosen bulls. For this reason, therefore, it is usual to keep more than one bull of a particular blood line. Even this precaution does not completely satisfy some farmers.

It is not always possible to determine the early onset of "heat," and therefore communication to the Centre may be delayed. Difficulties have occurred through accidents or temporary incapacity disrupting the planned movement of the technicians. The farmer is relying on an agency not under his own control.

Human nature is complex and rarely can one individual get ready acceptance and support from a wide group. The personality of the Manager of a Centre or of the Technicians may prove a disadvantage to some farmers.

There have been cases recorded where faulty organisation and technique directly attributable to inefficiency on the part of the Manager and Staff has caused considerable losses through low conception rates and faulty sires.

Difficulties.

There are many difficulties, however, under Australian and New Zealand conditions in spreading the use of the best bulls as widely as possible. These difficulties, however, should be possible of solution, but they cannot be tackled until an effort is made to establish Centres in districts where preliminary surveys show that primary conditions are suitable.

It is accepted generally that cow population must be concentrated before there is a reasonable chance of any scheme operating economically. Various inquiries suggest that the minimum number of cows for successful operation of a Unit is about 1,000, with estimates of the maximum number at from 1,500 to 5,000.

Consideration of the distance which it might be necessary to cover in order to attend the cows on a number of farms suggests that the maximum permissible distance should be not more than 20 miles, although up to 30 miles may be practicable.

Units cannot be established without preliminary expenditure on land, buildings, bulls, laboratory, equipment. In addition running expenditure would be incurred prior to there being any revenue from farmers. This would cover the cost of maintaining the property and feeding the bulls, salaries of the attendants and technicians and travelling expenses. Consequently a farmer-controlled Unit would necessitate the provision of capital in advance of the Unit being actually commenced. In co-operative associations in the United States, the practice is to charge members a preliminary fee, but there is little information to indicate whether sufficient support is obtained in advance of commencing operations to cover the financial commitments or whether assistance is obtained from financial institutions or from Government Agencies.

Another point which would affect the number of applications by farmers for membership would be the financial obligation which would be placed on them after a Centre was in operation.

Fees in England appear to have varied from 25s. to 30s. per cow got in calf, and it is unlikely that the costs in this country would be less. This has been a deterrent to some in developing interest, and there is no doubt that the annual demand of fees of this size would prevent others from agreeing to participate. However, this is not a sound reason. It has already been pointed out that the saving from not having to keep a bull on the farm would enable at least one additional cow to be kept. The profits from this cow would go towards the cost of the insemination fees. We could go further and say that the whole of the return from that cow could be considered an offset to the fees, as the cost of keeping the cow would not be more than keeping a bull. It may be of interest to make some estimation of the cost of keeping a bull. The following items may be included :—

The loss of income by keeping a bull instead of a cow may be assessed as being the value of 240 lb. butter fat. This average is higher than the average for our cows, but is adopted because of the special attention and feeding which is given to a bull and which should be sufficient to get this production from a cow. The value of the production loss, therefore, is	£30
Special accommodation is necessary for a bull, and it would not be an over-estimation to say that £100 is expended in providing special sheds and yards and paddock fences for the animal—at 10 per cent. depreciation this would mean an annual cost of	£10
Annual maintenance of premises for a bull, and interest on the value of the animal are higher than for a cow. Further, the actual cost of replacement is greater. Ten pounds can be included to cover the cost of these items.	£10
Total cost for one year.	£50

Thus we can calculate the actual cost per cow of keeping a bull. This will vary according to the number of cows for each bull.

In a 20-cow herd it is	£2	10s. 0d.	per cow.
,, 25-cow ,,	£2	0s. 0d.	,,
,, 30-cow ,,	£1	13s. 4d.	,,
,, 35-cow ,,	£1	8s. 6d.	,,

On a farm on which milk is produced for the Metropolitan Area, costs of keeping a bull calculated on this method are much higher. As an average of 240 lb. of butter-fat was taken in the previous case, 600 gallons is taken as the production lost through keeping a bull. If all milk is valued at 1s. 11d. the total costs would be £77 10s., which, when apportioned on a cow basis, gives the following :—

In a 20-cow herd it is	£3	17s. 0d.	per cow.
,, 25-cow ,,	£3	2s. 0d.	,,
,, 30-cow ,,	£2	12s. 0d.	,,
,, 35-cow ,,	£2	4s. 0d.	,,

It can be appreciated, therefore, that a possible fee range of 25s. to £2 or more should not be a deterrent to farmers being interested in having their cows stocked by animals of far higher quality than it would be possible for them to purchase.

In the preliminary stages of organisation in Australia, difficulty would most certainly be experienced in obtaining personnel with sufficient training. It is not necessary that those who are handling the bulls and carrying out the work of insemination should be qualified veterinarians, but they should have sufficient training to ensure that the work is done efficiently. Another difficulty which is experienced in many places and which would be encountered in Western Australia is

that of arranging easy communication between the farms and the Centre. A very ready system would be needed so that the farmer could be assured of having his messages delivered in sufficient time for the cows to be treated and at the same time enable the technicians to organise their day's operations.

Not the least important of the problems to be overcome is in the selection of suitable sires. It is easy to speak of using the best sires over the greatest number of cows, but it is not so easy to determine which are the best sires and even when they are located to be able to procure them for work at the Centre.

This information can be given only from a fully developed system of herd recording linked with sire surveys. It is an unfortunate fact that in most dairying districts the majority of successful dairy bulls are dead before their value has been recognised. In many places the farmer is reluctant to buy a mature bull. His interest is always in the young animal which has not been used previously. He is concerned with the butter fat backing and the ancestry of the bull, but there is no possibility of a young animal having been proved through his progeny before purchase.

The attitude of the farmers themselves can be another serious difficulty. Not all are prepared to agree to scrap their present system of breeding and join in an artificial insemination programme. The cautious ones want to see the experimentation carried out by the other man. They desire to see the system proved in their own conditions before becoming a party to the scheme. Apart from those who are genuinely interested but whose caution would hold them out temporarily, there are others whose lack of interest in herd improvement can be overcome only by an over-whelming demonstration of success in the majority of the herds. There is a natural reaction on the part of others to be independent of any outside assistance. All of these factors would reduce the number of herds which would be made available in any district at the inception of the scheme.

Overseas reports have shown how other difficulties occur.

The expansion of the one Exploratory Centre to embrace 3,000 cows in the near vicinity was delayed owing to low conception rates due to a toxic substance from the rubber in part of the collecting equipment.

Another factor contributing to low conception rates was the technique of insemination. It was shown that the uterine was superior to the cervix method.

Other difficulties have been associated with the seasonal character of dairying, which involves a heavy demand for the technician's services for a short period in each year.

The result has been that, in some countries, authorities seem to be forsaking temporarily, at least, the possibilty of using the best of the bulls over the whole of the herds. This is due to the paucity of really good bulls and the uneven call for service during the various seasons of the year.

The present approach appears to be in the direction of encouraging stud breeders to co-operate in the use of specially good bulls so that their sons may be available for natural service in commercial herds.

Data is accumulating throughout the world to show that the next best bull to the proved bull is the son of a proved bull. For example the Ayrshire Society in Scotland in a study of 731 proved sires showed that 82 per cent. had one or more proved sires in their nearest three male ancestors. Only 18 per cent. had no proved sires close up in the pedigree.

The Problem in Western Australia.

In considering the desirability of establishing a system of Artificial Insemination in Western Australia, it is necessary to take into account not only its potential value in improving production capacity more quickly than under a natural mating system but whether conditions render the organisation of efficient Centres practicable.

There is no doubt that, considering the dairying industry in this State dates only from 1920, excellent progress has been made. However, efficiency is as yet far behind dairying countries such as New Zealand and Denmark. There is in this fact a challenge to take advantage of the experiences of these countries so that further progress in this State may be more rapid than has been the case with them.

It is possible that the use of Artificial Insemination combined with improved husbandry practices will permit this to be achieved.

There are difficulties which may delay implementation. There is the question of finance. It appears improbable that farmers will provide the capital with which to initiate the service.

Frequent requests have been made by farmers' organisations for a Centre to be started by the Department of Agriculture. This would mean that the capital cost of the preliminary establishment would be found by the State Government. This is probable as it is intended that an Exploratory Centre will be established in the dairying areas as soon as practicable. The cost of distribution to the cows on private farms would naturally be the responsibility of the farmer, and there is no reason to expect that he would not be prepared to accept the full cost of this work providing it was not greatly in excess of the costs of natural mating.

This brings us to a consideration of whether it is likely that costs of distribution would be sufficiently low to warrant an expectation of full support of farmers. Reference has been made to the need for compact areas, and West Australia is only a sparsely settled country. Distances between farms and districts are greater than in most other dairying countries where Artificial Insemination has been successfully organised, but there does appear to be a number of districts where farms are sufficiently compact to warrant close examination. This and the difficulty of providing satisfactory communication with the Centre would be among the major difficulties.

The seasonal character of dairying, with a high incidence of early calving—over 70 per cent. of the cows calve in April, May, June and July—means that service would be required for a similar number of cows in July, August, September and October. If 2,500 cows per annum are considered a reasonable number for an inseminator where calving is spread throughout the year, it may be realised that difficulties would be experienced if 1,750 of these 2,500 had to receive attention during four months only. It would necessitate the employment of a larger number of men to cope with this seasonal activity, with insufficient work to keep them fully employed during the remainder of the year. Therefore, the possibility of higher costs being incurred through having men not fully employed would have to be considered.

Another very great problem would be finding sufficient bulls of quality. There are few "proved" to be outstanding in this State, and there is no guarantee that their owners would be prepared to let them go. There may be many others, but the data is not available demonstrating their worth. Experience wherever Artificial Insemination has been established has indicated that the finding of suitable sires has been the outstanding problem.

There are about 100,000 cows in our dairying areas proper, and, if we assume that 30 per cent. were to be included in a scheme ultimately, we would need 60 very good bulls. It is obvious we could not find them locally.

An experience in another State recently, where there is a very large cow population and where herd testing has been established on a wide scale for many years, proved that it was more than difficult to find proved bulls. The chances of finding them in other States would be most remote. Perhaps there are some in New Zealand, but we recall that there were only afew bulls during the period in which surveys had been made, which, in herds averaging 360 lbs. butterfat and over, had raised the level of yields in their progeny. Thus, as the New Zealanders are anxious to retain their proved bulls, and as there would be other prospective purchasers, the number we could hope to procure would be small.

Thus it is evident that a widespread scheme would not be practicable for some years to come and not before it was possible to select a large number of bulls proved good through their progeny performances.

Out of this argument comes one important point. " Proved " bulls are located by recording the performances of their progeny with or without a comparison with the yields of their mates. This information can come only from an efficiently organised system of herd recording which is used widely by dairy farmers.

The West Australian system has been improved, and heifers sired by pure-bred bulls are being marked for future identification, so that when they come into profit their productions may be tabulated according to their sires.

It would appear that the most practical method would be to purchase wherever they can be found *not a large number of bulls at fantastic prices* but a *few selected of outstanding quality.* Service to stud herds whose owners would be prepared to co-operate would be desirable so that sons of the good bulls would be available for natural service in commercial herds from which, after testing, those outstanding could be taken for wider Artificial Insemination schemes. During the preliminary period, Artificial Insemination would be restricted to commercial herds in the most compact and, therefore, economic centres.

A plan, therefore, would be to establish first of all a " pilot " centre where exploratory work with a single breed could be carried out. It would serve also as a training place for technicians. Later, as it proves practicable, the service could be extended to selected herds where owners were prepared to co-operate. If these included breeders of pedigree cattle, it would be so much the better. At this stage it should be a requirement that all herds should be recorded for production, so that a measure of the success of the scheme could be obtained. At the greatest, service from the Centre should be not more than 20 miles.

Later, the next step could be, to establish distributing centres at more distant points, which would be supplied with diluted fluids. At these centres equipment for holding supplies, a refrigerator, washing and sterilising facilities would be essential. A telephone and attendant would be necessary also. These distributing centres would operate as a main centre, with the sole difference that bulls would not be kept.

This system would involve keeping all bulls for several districts on one property, thus reducing costs for yards, handling, laboratory facilities, etc. This would facilitate administration and veterinary supervision of the bulls. Supplies could be despatched to the subsidiary centres daily or thrice weekly by public conveyance. Transport is so organised today that little difficulty would be expected in getting supplies to the centres which appear to have the greatest possibilities.

New settlement areas would present an unique opportunity for improving the herds of the settlers. In such a scheme, one could visualise a situation where a bull never entered a whole district. Supplies could be obtained from a bull-holding farm. It might prove desirable, however, even in such a new area to establish its own bull-holding farm from which local distributing centres would draw their supplies.

RATE OF MILKING WITH MACHINES

SOME RESULTS FROM WEST AUSTRALIAN HERDS.

M. Cullity, Superintendent of Dairying.

MODERN knowledge of the physiology of milk secretion and the technique of milking, has directed attention to methods of using the machine which have an influence on yields, the likelihood of udder diseases, the tendency to make cows hard milkers and labour requirements.

Workers in research centres in the United States of America, notably Dalburgh of New York Experiment Station and Petersen of the University of Minnesota, have shown that most cows can be conditioned to give all their milk in from three and a half to five minutes and that they do not, in most cases, require hand-stripping. These results were achieved by conditioning the cows to let down their milk by a regular routine before teat-cups were put on and from the adoption of a method of removing the loose milk in the udder before the teat-cups were taken off. The fact that rapid milking will get more milk has also been confirmed.

Preliminary observations made by Recorder F. Coates of Pinjarra Herd Recording Unit in 1947–48, provide data justifying the belief that far too much time was wasted in milking and that machines were left on the cows too long.

If the position disclosed as existing in the Pinjarra district were characteristic of methods throughout the dairying areas, there obviously existed an opportunity for farmers to obtain more milk and reduce time in the milking shed by speeding up milking.

It was decided, therefore, to arrange for Recorders to measure milking times of all herds under test. This was done during monthly routine visits to farms in 1948–49.

Twenty four Recorders collected data from 451 herds. The method used was to record the time of commencing to handle the first cow and the time of the taking off of the teat cups from the last. The average time per cow was then calculated :—

$$\frac{T}{C} \times U$$

T = actual time taken to milk all cows.
C = number of cows.
U = number of units in the machine.

It is necessary to mention that farmers claim that milking takes longer when the Herd Recorder is present. This is admitted, and also the probability that more time is lost in some herds than in others because of the slight re-arrangement of normal organisation due to the use of test buckets on releasor machines and the need for the Recorder to have the separate quantities of milk from each cow for weighing and sampling. Accordingly the times recorded are somewhat longer than would be required under normal working conditions. However, the extra time included does not obscure the variations between farms in the speed of milking, or the fact that the rate on most farms is too slow.

Some details are given in Tables 1–4. Rates of milking have been grouped six minutes and under—6.1 to 9.9 minutes and ten minutes and over. No attempt has been made to differentiate between the times recorded for each make of machine. There is not sufficient data to warrant such an examination.

An examination of the daily data sheets shows a variation in milking times in the individual herds from four and a half to 18 minutes per cow.

In the grouped results for the various machines—see Table 1—there is a variation from five to 15.7 minutes per cow. It is obvious that there is gross inefficiency in some sheds. This is serious because of the probable damage to the milking capacity of the cows and to the wasteful usage of labour.

TABLE 1.

AVERAGE MILKING TIMES FOR VARIOUS SIZES AND MAKES OF MACHINE GROUPED ACCORDING TO TIME OF MILKING.

Make of Machine.	10 Minutes and Over. Average Milking Times (Mins.)					6·1 Minutes to 9·9 Minutes. Average Milking Times (mins.)					6 Minutes and Under. Average Milking Times (mins.)				
	6	5	4	3	2	6	5	4	3	2	6	5	4	3	2
A	....	....	13·0	....	....	....	....	7·6	6·4	7·4	....	....	....	5·4	5·7
B	....	....	....	11·0	....	....	....	8·0	8·7	....	....	....	6·0	....	....
C	....	....	....	....	....	....	....	....	....	7·1	..	....	....	.	5·5
D	12·5	13·6	11·8	10·9	10·7	....	....	8·2	6·4	6·7	....	....	6·0	5·8	5·5
E	10·7	....	11·6	12·2	11·4	8·0	....	8·3	9·1	7·5	....	....	6·0	5·7	5·3
F	11·0	15·7	11·5	11·2	11·4	8·5	....	7·8	8·1	7·5	....	....	5·1	5·2	5·0
G	....	....	10·2	11·1	12·5	....	....	7·0	8·0	7·4	....	....	....	6·0	5·6
H	....	11·0	11·0	12·4	10·0	....	9·2	8·1	7·5	7·3	....	....	6·0	5·2	5·2
I	....	....	12·3	11·0	10·1	....	....	8·2	8·2	7·7	....	....	....	....	5·3
J	....	....	11·9	....	10·0	....	....	7·5	7·1	7·5	....	....	....	5·2	5·3
K	....	10·8	10·2	....	10·4	....	....	8·9	7·5	7·5	....	....	....	5·4	6·0
L	....	....	10·0	11·4	11·3	....	....	7·5	7·7	7·6	....	....	....	5·5	5·3
M	....	....	11·4	10·0	....	....	....	8·4	7·3	8·0	....	....	6·0	5·7	4·7
N	....	12·2	12·9	11·0	10·0	....	....	8·8	7·5	7·5	....	....	....	....	5·5
O	....	12·3	12·2	....	....	....	7·5	....	7·1	....	....	5·5	....	5·2	....
P	....	....	....	....	....	..	..	.	8·4	....	....	....	....	....	....
Q	....	....	....	....	..	....	....	....	....	6·8	....		....	.	5·5
R	....	....	....	....	..	....	....	....	....	7·3	....		....	....	4·4
S	....	....	....	....	..	....	....	9·3	..	....	....		....	....	....

It will be seen from Table 2 that there is a progressive lengthening of the time of milking as the machines get larger, as under :—

2	Unit machines	7.2	minutes per cow.
3	,, ,,	7.8	,, ,,
4	,, ,,	9.3	,, ,,
5	,, ,,	11	,, ,,
6	,, ,,	11.2	,, ,,

Further evidence that the smaller machines are being used more effectively is contained in the percentages of each size of machine which were successful in completing the milking process in six minutes or less. (Table 5.)

TABLE 2.

AVERAGE MACHINE MILKING TIMES FOR EACH MAKE OF MACHINE.

Machine.	Average Milking Time per Cow.									
	6		5		4		3		2	
	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.	No. of Tests.	Mins.
A	....	.. .	....	....	10	8·5	7	5·7	12	6·7
B	....	. ..	....	....	10	7·5	7	9·5	....	....
C	....	.	....	....	..	....	....	....	8	6·1
D	6	12·5	10	13·6	97	9·1	173	7·0	170	7·1
E	4	10·7	....	....	74	9·8	309	8·8	390	6·5
F	6	10·2	4	15·7	60	9·1	135	8·5	83	7·8
G	....	....	....	....	4	7·7	42	8·9	110	8·0
H ...	....	. ..	7	10·4	34	8·7	16	8·2	20	7·0
I	....		....	....	17	11·9	19	10·0	60	7·5
J ...	....	. .	. ..	...	12	11·0	10	8·0	23	7·3
K	....	.	5	10·8	4	9·2	21	6·6	16	8·0
L	....	.	....	....	14	7·9	76	8·2	202	8·3
M	....		....	....	11	9·5	36	7·3	19	7·0
N	....	. ..	2	12·2	5	12·4	3	7·5	24	6·3
O	....	..	6	7·5	1	12·5	7	6·6	....	....
P	....	....	....	....	....	....	3	8·4	....	....
Q	....	....	....	....	....	....	4	6·8	1	5·5
R	....	. ..	....	....	....	....	....	....	4	6·5
S	....	....	....	....	2	9·3	....	....	....	....
Totals and Average Times	16	11·2	34	11·0	355	9·3	868	7·8	1142	7·2

See Table 1.

TABLE 3.

MILK PER COW PER MILKING, IN POUNDS, ACCORDING TO MAKE OF MACHINE AND TIME GROUPINGS.

Make of Machine.	10 Minutes and Over Units.					6·1 Minutes to 6·9 Minutes Units.					6 Minutes and Under Units.				
	6	5	4	3	2	6	5	4	3	2	6	5	4	3	2
A	....	..	9·0	....	..	....	....	21·8	21·0	27·0	....	....	....	20·0	23·0
B	...	.	..	7·0	....	....	....	21·7	15·2	....	....	....	22·0	....	....
C	....	....	....	....	....	....	....	....	20·2	....	....	....	..	....	....
D	22·5	20·6	24·4	20·3	12·3	....	....	22·0	21·5	24·4	....	....	.	24·4	22·2
E	31·0	....	24·0	23·5	26·0	11·0	....	27·6	21·7	23·5	....	....	·8	25·0	24·8
F	25·5	22·0	20·8	23·0	19·0	29·0	....	20·0	23·5	21·0	....	....	·7	19·7	20·3
G	....	....	13·7	27·4	21·0	....	....	13·5	24·3	22·0	....	....	....	15·0	20·0
H	....	26·0	23·1	17·7	17·5	....	19·4	23·0	23·7	17·5	....	....	15·0	18·7	18·2
I	....	....	21·8	22·0	22·8	....	....	19·0	21·4	22·3	....	....	....	....	22·0
J	..	....	24·5	....	15·0	....	....	22·0	21·3	23·4	....	....	....	18·0	25·8
K	....	24·0	27·0	....	24·7	....	....	24·0	18·3	24·2	....	....	....	14·3	20·0
L	....	....	26·0	20·6	27·7	....	....	23·7	23·8	21·5	....	....	....	20·4	19·6
N	....	....	24·0	24·0	....	....	....	21·3	23·0	24·5	....	....	26·0	36·3	18·2
M	....	16·2	11·0	7·5	26·0	....	....	15·5	15·0	24·0	....	....	....	....	21·0
O	....	24·0	22·0	....	....	....	26·7	....	24·0	....	....	24·3	....	20·0	....
P	....	....	....	....	....	....	....	....	19·3	....	....	....	....	....	....
Q	....	....	....	....	....	....	....	....	....	24·0	....	....	....	....	15·0
R	....	....	....	....	....	....	....	....	....	24·3	....	....	....	....	16·0
S	....	....	....	....	....	....	....	26·4	....	....	....	....	....	....	....

TABLE 4.

MACHINE MILKING TIMES—SUMMARY OF TABLES 1, 2 AND 3.

Machine Units.	Key.	10 Minutes and Over.	6·1 Minutes to 6·9 Minutes.	6 Minutes and Under.
6	No. of times machine recorded	10	6	....
	Average milking times	11·8	8·1	....
	No. of cows milking	440	410	....
	Average milk per cow per milking (lb.)	24·2	21·9	....
5	No. of times machine recorded	27	6	1
	Average milking times	15·3	8·2	5·5
	No. of cows milking	1133	281	134
	Average milk per cow per milking (lb.)	21·9	25·0	24·3
4	No. of times machine recorded	137	202	16
	Average milking times	12·4	8·1	5·6
	No. of cows milking	3965	7421	554
	Average milk per cow per milking (lb.)	23·9	23·5	24·7
3	No. of times machine recorded	145	635	85
	Average milking times	11·7	7·6	5·6
	No. of cows milking	2814	15293	3206
	Average milk per cow per milking (lb.)	22·4	22·1	22·5
2	No. of times machine recorded	92	771	283
	Average milking times	11·0	7·5	5·3
	No. of cows milking	1359	12836	5307
	Average milk per cow per milking (lb.)	20·5	22·4	22·1

TABLE 5.

PERCENTAGE OF VARIOUS SIZES OF MACHINES MILKING IN SIX MINUTES OR LESS.

Size of Machine Units.	Total Number of Tests.	Percentage six minutes or less.
2	19,502	24·7
3	21,313	8·8
4	11,940	4·5
5	1,548	2·9
6	850	....

An examination of tables 3 and 4 will show that longer milking times have not been due to larger flows of milk as in most cases as much milk was obtained with the short period of milking as with the longer periods. This is shown by the summarised results in Table 6.

TABLE 6.

QUANTITIES OF MILK FOR EACH SIZE OF MACHINE IN TIME GROUPINGS.

Size of Machine Units.	10 minutes and over.	6·1 to 9·9 minutes.	Six minutes and under.
6	24·2	21·9	....
5	21·9	25·0	24·3
4	23·9	23·5	24·7
3	22·4	22·1	22·5
2	20·5	22·4	22·1

The position becomes still more clear by an examination of the quanities of milk obtained per minute by each size of machine in the various time groupings. See Table 7.

TABLE 7.

POUNDS OF MILK OBTAINED PER MINUTE.

Size of Machine Units.	10 minutes and over.	6·1 to 9·9 minutes.	6 minutes and under.
6	2·05	2·7	....
5	1·43	3·0	4·4
4	1·9	2·9	4·4
3	1·9	2·9	4·0
2	1·86	3·0	4·2

It is, of course, likely that with the longer periods all the milk was drawn long before the teat cups were removed and thus the rates per minute given above may not be strictly accurate as a measure of rate of flow. Even so the fact remains that the teat cups were left attached longer than necessary and time was wasted together with considerable risk of injuring the cow or at least making her a hard and slow milker.

Some idea of the time wasted and its value at current award rates may be gauged from the data in Table 8, showing conversions of the average milking times into the equivalent of eight hour days over a lactation period of 273 days.

TABLE 8.

VALUE OF TIME WASTED IN SLOW MILKING.

Size of Machine Units.	Time required to Milk One Cow.		Excess Time Over five Minutes per Cow.		
	Minutes per Milking.	Eight hour days per Lactation.	Eight hour days.	Value.*	
				Per Cow.	Per 30 Cows.
				£ s. d.	£ s. d.
2	7·2	8	2¼	1 19 3	58 17 6
3	7·8	9	3¼	2 16 8	85 0 0
4	9·3	10½	4¾	3 14 0	111 0 0
5	11·0	12½	6¾	5 17 8	176 10 0
6	11·2	12¾	7	6 2 0	183 0 0

* At current award rate of £6 2s. per week of 56 hours.

These figures seem to emphasise the extreme importance of the labour cost which can be wasted by slow milking or poor organisation in the bails. In addition to this, is the probable loss of production because of the failure to take advantage of the let down to milk thoroughly. No assessment of this loss can be made.

Where the farmer is employing labour the loss through wastage of time will appear to be very evident. Where he is doing the work himself or is assisted by his family, the financial loss may not appear to be so great, but he is certainly losing the opportunity of carrying out other farm activities which would help him to increase production or else improve his property.

There is no evidence to suggest that the longer times recorded mean that the teat-cups are on the cows for the whole of this period, as a considerable loss of time occurs due to the method of handling the cows in the shed. With modern " walk-through " bails and no hand-feeding, very little time need be lost in transferring the teat-cups from one cow to another, but frequently time is lost because of delay in bringing the cows in or in undertaking sundry other jobs in the diary or its vicinity during milking.

There is sufficient information in the figures to show that in many cases farmers have over-equipped their sheds with units. In several cases herds of equal size have been milked as rapidly by 2-unit machines as those with 4-units or larger. In other words, too many units have been installed for the labour that is available. This probably is the most important explanation for the rise in milking time per cow with the increase in the number of units.

In view of the high cost of labour, farmers naturally are interested in making the most effective use of that available. This can be done by adopting a regular routine at milking time so that the cows will come to the shed when required and they can be turned out again conveniently after the machines are removed.

To enable the most efficient routine to be adopted, it is desirable that the sheds and yards be laid out with the greatest degree of convenience so that there will not be any unnecessary confusion to the cows, either in bringing them into the shed or in turning them out. It is desirable also for the farmer to study the lay-out of bails in relation to the milk room and wash-up room so that the time required to attend to the separator and the bails is not greater than necessary. Considerable time and energy can also be saved by the development of a routine in doing all the tasks associated with the preparation of the cows, the handling of the teat-cups and the attention to the milk room.

BETTER DAIRYING COMPETITION, 1949-50

THE Australian Dairy Produce Board Pasture Improvement Committee (W.A.) is conducting a Better Dairying Competition, with a view to encouraging better dairy practice, and in particular the greater conservation of fodder, and pasture production.

The Dairy Belt is divided into seven Zones, full information being obtainable from the local Dairy Officer, or from the Dairy Branch, Department of Agriculture, Perth.

Zones are as follow :—

Zone 1—Coastal.

Zone 2—Bunbury-Donnybrook.

Zone 3—Busselton-Margaret River.

Zone 4—Bridgetown.

Zone 5—Manjimup-Northcliffe.

Zone 6—Great Southern.

Zone 7—South Coastal.

Four prizes will awarded in each Zone as follows :—

First Prize	£20 and framed certificate.
Second Prize	£12
Third Prize	£8
Fourth Prize	£6

Judging will be carried out by Officers of the Dairy Branch, Department of Agriculture, on the following basis :—

		Points.
1.	Conservation of Fodder and Summer Crops	280
2.	Pastures	240
3.	Dairy Herd	150
4.	Return of Butter Fat, etc., per acre	120
5.	Pigs	30
6.	Farm Management	130
7.	Utilisation of Skim Milk	50
	Total	1,000

Where a competitor sells his product in liquid milk form, the scale of points will be adjusted so as to place him on a relative basis with competitors who supply cream to a butter factory.

Prize winners in the 1948–49 Competition will be handicapped as follows :—

		Points.
First Prize Winner	....deduct	15
Second Prize Winner	,,	10
Third Prize Winner	,,	5
Fourth Prize Winner	,,	1

ZONE 6—GREAT SOUTHERN.

In this Zone the Competition will be in the form of "Fodder Conservation" judged on the following basis :—

	Points.
Fodder conserved per head of dairy cows	100
Use of Phosphatic Licks	25
Silage or Summer Fodder Crops	50
Sanitation of Dairy Premises	25
Total	200

Where both silage and fodder crops are provided, the scale of points to be halved in these sections so that the total in these sections shall remain 50.

Entries are free and close on 30th September, 1949.

Entries should be made to the Superintendent of Dairying, Department of Agriculture, Perth, or the District Agricultural Adviser.

Judging will commence on 1st November, 1949, and will be completed by 28th February, 1950.

ALBANY AGRICULTURAL AND HORTICULTURAL SOCIETY PASTURE AND MEADOW HAY COMPETITIONS 1948-49.

C. W. TOBIN, Dairy Instructor.

For the third year in succession the Albany Agricultural and Horticultural Society conducted Pasture and Meadow Hay competitions in the Albany district, and once again the Society is to be commended for its interest in these activities.

The number of entries was below usual for the apparent reason that the whole district has embarked on a new clearing and pasture expansion programme, and with outside labour for this work not available it must be undertaken by farmers who find it difficult to participate in all the opportunities offering.

Seasonal conditions were generally favourable with early opening rains, a normal winter followed by warm weather and showers in the spring. In spite of this there was a noticeable deterioration in subterranean clover pastures on some properties.

The whole of the pasture on each property was judged in late November and February in order to more accurately assess the position with regard to stocking and management. An entirely different picture is presented in February to that in November when all pastures are in their prime, and with two inspections a fairer result can be obtained.

The quality of Meadow Hay showed a slight improvement on past years. Power mowing and baling is becoming more popular and is assisting quality and quantity conserved for the reason that the crops can be handled in less time. However, there still is in most cases a large gap between amount conserved and amount adequate to meet requirements. and it is here competitors generally lose the greatest number of points.

The prize winners in this year's competitions are as follows :—

PASTURE CLASS.

Competitor	Density and evenness of sward 60	Absence of weeds and insect pests 25	Botanical composition 40	Management 75	Total 200
F. Pease, Torbay	52	22	36	73	183
Farr Bros., Youngs Siding	53	22	36	71	182
R. B. Wilkinson, King River	50	22	34	70	176

F. Pease.—This property consists of 70 acres of pasture sub-divided into 17 paddocks carrying subterranean clover, rye grasses, paspalum and a little kikuyu. Subterranean clover is weaker than usual but this is consistent with other competitors. The rye grasses are strong and healthy and on most of the paddocks made nice even growth.

Fodder conservation in hay, silage and maize at the rate of between two to three tons per cow shows management to be commended.

Stocking comprised of 25 cows and eight other cattle, all in good condition on both inspections.

Fertilising was at the rate of approximately 210 lb of superphosphate per acre.

Farr Bros.—The property has 130 acres of pasture made up of 100 acres of old established subterranean clover, rye grasses and patches of kikuyu, and 30 acres of second year clover sown on the burn on part cleared redgum–jarrah country. The old pasture continues to stand up well, and the new is increasing in density.

Fodder conservation this year is light and leads one to believe that the herd may be increasing too quickly for the expansion of the pasture area. If this happens a fall in butterfat production is inevitable.

The stock on the property amounted to 46 cows and 56 other cattle.

Fertilising was at the rate of three cwt of superphosphate per acre.

R. B. Wilkinson.—This property consists of 175 acres of established pasture part of which is sub-divided into small paddocks for rotational grazing, and there is a further area of newly sown clover. The old pasture comprised of mixed clovers, paspalum and kikuyu on the low country is in very good condition, but the surrounding hillsides leave room for improvement in species and density. A heavier clover crop could be expected, and the introduction of grasses into these paddocks is recommended.

Stock amounted to 28 cows and 37 other cattle.

Fertilising was at the rate of 1 cwt of superphosphate per acre and it is reasonable to believe that heavier dressings of fertiliser would improve results.

MEADOW HAY CLASS.

Competitor	Botanical Mixture	Type and palatability	Time of cutting	Aroma	Amount per cow	Total
	20	30	25	10	15	100
F. Pease, Torbay	17	25	22	8	15	87
R.B.Wilkinson King River	18	26	22	8	9	85
Farr Bros., Torbay	18	22	21	7	6	74

F. Pease.—Three stacks of hay were inspected, one being a carry over from the previous year. The mixture was mainly clover and rye grasses, fairly well made and in good condition.

Conservation of fodder is a strong point with this competitor and the amount conserved per cow enabled him to score full points in this section.

R. B. Wilkinson.—This entry comprised mainly of baled hay from a late cut off summer land plus a small stack carried over. The new hay consisting of late grasses and clover was in good condition and well made. The old stack had deteriorated but was in fair order.

The quantity conserved fell short of what is considered adequate, i.e., 2½ tons per cow.

Farr Bros.—The mixture was quite good but variable in colour and condition as affected through being out too long prior to baling.

The quantity conserved was a long way short of requirements.

BACONER CARCASS COMPETITION

STATE AND ZONE CHAMPIONSHIPS

THESE competitions are sponsored by the Australian Meat Board and are conducted with the co-operation of the Department of Agriculture, The Royal Agricultural Society, The Farmers' Union, The Bacon Curers' Association, The Meat Export Establishments (Spearwood, Bellevue and Albany), Western Australia, and the Commonwealth Department of Commerce and Agriculture.

For the purpose of the competitions, the State has been divided into six zones, in which separate competitions will be held and from which the prize winners will compete for Championship Prizes.

The accompanying map shows the boundaries of each zone.

AWARDS.

The following awards will be made :—

State Champion	£21—plus trophy valued at £15.
Reserve Champion	£10—plus trophy valued at £5.
First prize each Zone	£10
Second prize each Zone	£5
Third prize each Zone	£1

Subject to the entries being in the opinion of the judges, of sufficiently high standard.

Pigs should be despatched to the normal export killing works and will be received at each of these works at any time between July 13 and September 14.

The animals will be held for 48 hours before slaughter, carcasses will be marked for identification and chilled.

Arrangements will be made for the display of carcases on Thursday, October 6 (during the Royal Show week), at which time the prizes will be distributed. The display will be made at a point to be determined, and competitors will be advised accordingly.

CONDITIONS.

1. The competition to be open to all pigs sired by a pure bred boar. Entries to be accepted only from the owners of the pigs entered who also must be their breeders—that is, the owners of the sows when the entered pigs were born. Entries to be made on the printed Entry Form and all particulars set out on the form to be completed.

2. Each entry to consist of *one* animal.

3. Entries to be restricted to not more than *two* from any one owner.

4. To be eligible for the competition, the carcasses must come within the weight range of 120–180 lbs. *chilled* dressed weight including heads.

5. The carcasses shall be judged by the Hammond appraisal system (breeders' points only).

6. Any contract of sale or purchase of the carcasses shall be made between the entrant and the killing works at which pigs are slaughtered.

7. Compensation for mutilation : The Board undertakes to pay the factory ½d. per lb. dressed weight including heads to compensate for mutilation in judging.

8. Entries to close on September 1, 1949, and forms to be addressed to State Representative, Australian Meat Board, Box R1278, G.P.O., Perth.

9. The decision of the Board or any person nominated by them to judge or to decide any disputes that may arise in connection with these conditions or the conduct of the competitions shall be accepted by entrants as final.

10. Intending competitors should advise the works to whom the pigs are being consigned, full details regarding numbers being forwarded, whether by rail or road, and identification marks.

11. If any further details are required by intending competitors, contact should be made with the office of the State Representative, William Street, Perth.

THE RUNT AND ITS PLACE IN PIG HUSBANDRY

V. B. MONTI, Dairy Instructor.

WE are all familiar with the runt or runts in a litter and the problem is how can these undersized and unprofitable pigs be eliminated.

The pig to foster is the one that shows a profitable return over feed and labour. There are two main stages in the development of a piglet, the development within the uterus and the growth and development that takes place after birth. This creative condition is controlled by the two factors, heredity and environment.

Heredity of course will have most effect on the unborn piglet, but it is well known that certain families have the inherent power of making much more gain per pound of dry food comsumed than pigs from other families. Seeing that the inherent characteristics are out of the control of the breeder once the mating is performed it behoves him to select his breeding stock with the greatest of care, selecting only from those families which farrow a large number of normal sized, healthy piglets, having the inherent capacity for the most economic utilisation of food consumed. Selecting also from a sow that is a good mother and one with a copious milk supply. If the proportion of runts from any matings are abnormally high and there are no environmental factors contributing, then the parent stock should be disposed of.

Environment will effect piglets during pregnancy but its effect will tend to be the same on all pigs in the litter while the generic factors influence the individual. Once the pig is born size is an important factor, for, as a rule, the stronger pigs select the breast teats where the milk flow is strongest and the weaker piglets tend to be forced on to the rear teats where there is less milk and hence their progress is still further retarded.

Because pigs are small at birth it does not signify they will continue to be backward. In large litters it is only natural that the pigs on the average are going to be smaller, but if they possess the necessary inherent qualities and are fed a supplementary ration, a satisfactory weaning weight should be attained. The provision of creep feeding as soon as the piglets show the slightest inclination to feed is the surest way of ensuring satisfactory growth. If this supplementary feeding is not supplied, a litter may soon be noticed to split into two factions, the one, obtaining sufficient nourishment from the mother at the expense of the weaker ones which rapidly degenerate into a group of undernourished runts. The numbers in this latter group usually predominating the litter. This latter group will never make satisfactory growth after weaning and this factor makes all the difference in the profit or loss obtained. Therefore always provide creep feeding. Under-nourished pigs are also more prone to infection and losses from deaths are very liable to occur. Even if death does not result the infected animals are always unthrifty.

Anaemia is a common disease of sty fed piglets that are reared on concrete or other impermiable floor. If the piglets have not the access to a pastured run or an earth portion in the sty, a few shovelfuls of good clean earth should be supplied daily or some other iron supplement fed.

The provision of a well grassed run is one of the safest methods of ensuring a healthy well growing litter.

With the obvious runt which will not respond to good husbandry, it is better to dispose of it before it has consumed time and food unprofitably.

CLOVER DISEASE

PRACTICAL FINDINGS AND RECOMMENDATIONS FOR CONTROL.

F. L. Shier (1) and R. C. Rossiter (2)

DURING the past few years an infertility in ewes together with other breeding troubles and abnormalities of the sex organs of sheep became a serious problem in certain regions in Western Australia where pastures are composed predominantly of early (Dwalganup) subterranean clover.

Briefly the manifestations are *infertility*, or failure of ewes to get in lamb ; *dystocia*, a condition affecting ewes which have conceived but which make little or no attempt to deliver their lambs and fail to do so ; and *prolapse* and inversion of the uterus (turning inside out of the womb), which occurs typically in the Spring, some months after the lambing season. The infertility results in a progressive decline in lambing which may, in the course of a few years, fall to below 20 per cent. ; the dystocia results in death of the unborn lamb and a ewe mortality or wastage of up to 30 per cent.; while prolapse may lead to a 10 per cent. wastage.

Other manifestations are lactation in unbred ewes and in wethers. Wethers may also die from urinary obstruction a small percentage may show a "false bladder" visible externally as a large fluctuating swelling in the crutch ; this is almost invariably fatal.

In the March 1946 issue of the Journal of the Department of Agriculture of Western Australia, an account was given of the various manifestations of this disease, the extent of the problem, the knowledge obtained up to that time, together with a number of practical suggestions which it was felt should tend to minimise the overall effects of the disease and keep the total productivity of affected properties somewhere near their normal level.

Since then an intensive investigation has been continued by a team of workers into the pathological, chemical, agrostological and field aspects of the disease. A considerable body of scientific data and a much better understanding of the whole problem has been obtained. Many points still remain obscure and it would appear that much further patient investigation and experimentation will be necessary before this very complex problem, which has resulted in high losses on some properties and at one time appeared to threaten the sheep industry of the 20 25 inch rainfall area of this State, is fully understood.

The more scientific findings have been published by several workers in technical journals from time to time and these have been listed at the end of this article. Here it is proposed to deal only with those points which have a bearing on the practical side of the problem and its control in the light of present knowledge, in the form of a non-technical publication for the general guidance of farmers. This has been considered desirable in view of the additional scientific data now available. It should be pointed out, however, that although we are far from a complete understanding of all aspects of the problem, present experimental data strongly support the broad general recommendations made in the article referred to above.

This article has been prepared by the authors in collaboration with other members of the W.A. Technical Committee on Sheep Infertility.

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PRESENT KNOWLEDGE—PRACTICAL ASPECTS

1. The disease is of nutritional origin. It is not due to any infectious organism or the toxins produced by bacteria and eaten by sheep and consequently control cannot be expected by the development of an immunising vaccine such as is the case with entero-toxaemia (braxy-like disease) or botulism (toxic paralysis).

2. The disease results from the grazing of subterranean clover dominant pastures. It has been shown that the clover contains a potent substance which has an action on the sheep identical with that of one of the sex hormones, oestrogen. The sex hormones are chemical substances produced, normally, by certain glands in the animal body. They severally control and maintain the various reproductive processes and organs. The continued preponderance of one type of hormone, resulting from the ingestion of potent clover, completely upsets the hormone balance controlling the various reproductive processes. This also induces gross abnormalities in the sex organs of the ewe, notably a cystic condition of the uterus, and also of the wether. The exact nature or chemical composition of the factor or factors is not yet known.

Dominant subterranean clover. Clover disease could be expected in sheep grazed on this pasture during the green period. This is best utilised for meadow hay production and summer grazing.

3. The effect of this green subterranean clover grazing is progressive, in the case of ewes. Some cystic condition of the uterus (womb) has been demonstrated in ewe weaners after their first season on green subterranean clover. The degree to which these young ewes have been effected is not great, but it is apparently sufficient to reduce fertility somewhat at their first mating twelve months later, even if they were not on a dominant clover diet during their second winter and spring.

Two seasons of green clover grazing are sufficient to have a distinct effect on the fertility of ewes when mated as two tooths and some incidence of dystocia frequently occurs at lambing time. Maiden four-tooth ewes (mated at 2½ years) following three seasons on green clover are markedly affected, showing definite infertility and generally a high degree of dystocia at lambing of those ewes which had conceived.

4. These effects on the sex organs and fertility of the ewe are largely permanent. Maiden four-tooth ewes and infertile six-tooths (which had not produced a lamb at their first mating) from an affected property exhibited the major manifestations of the disease (infertility and dystocia) at three successive matings on a "sound" area (Merredin) where there was no subterranean clover grazing.

5. The clover appears to be highly potent throughout the green growing period but there is a rapid fall in potency after wilting.

Dry clover and clover hay have been found to contain very low amounts of the potent substance and can be consumed by ewes and wethers with impunity.

6. The other plant species of the affected region such as oats, Wimmera rye grass, other annual grasses, capeweed and small "native" clovers even in the green stage, do not contain sufficient of the potent substance to produce the harmful effects. As subterranean clover is unpalatable during the dangerous green growing period sheep maintained on a mixed pasture will, by selective grazing, avoid the consumption of harmful amounts of clover.

A well balanced pasture containing Wimmera rye grass and some cape weed in addition to subterranean clover. Clover disease would be unlikely in sheep grazed on this pasture.

7. Rams are unaffected. This is no doubt due to the counteracting effect of the male sex hormone (testosterone), produced by the testicles, which is antagonistic to oestrogen. The effect of testosterone injected into wethers, grazing potent pastures, has been demonstrated experimentally.

The high cost of this substance and other practical considerations, however, absolutely preclude its use for the control of " clover disease " in any of its manifestations.

8. Factors influencing the production of the potent substance in subterranean clover have been studied extensively and are still receiving consideration. It appeared possible that genetic or environmental factors might influence potency and that if so the disease might be controlled by the use of other (non-potent) varieties of subterranean clover or, for example, by appropriate manurial treatment of the soil.

The evidence to date strongly suggests that, in the West Australian environment at any rate, all varieties of the clover wherever grown will be dangerous in the green stage, and that sheep will develop " clover disease " if they have a dominant ration of such material for a sufficiently long period.

9. Although earlier evidence from some properties suggested that crossbreds were less susceptible to infertility and dystocia, than were merinos, recent experience indicates that the former may be equally affected. It is quite definite that the changing over to crossbreds cannot be recommended as a means of controlling the disease.

10. It appears extremely unlikely that the sudden onset of the disease in 1941 was due to any direct effect of war time superphosphate—such as an excess (as an impurity in the superphosphate) or deficiency of a particular element causing the production of the potent factor in clover. The reduced amounts of superphosphate available for topdressing at that time may have tended to produce more dominant clover pastures indirectly, by reducing the overall productivity of the pastures which in turn results in heavy selective grazing by the sheep of the smaller amounts of the more palatable non-clover species.

11. Cattle and horses bred and maintained on affected properties have shown no evidence of " clover disease."

CONTROL.

It is evident that sufficient information has been accumulated to suggest a system of farm and sheep management which should give a considerable measure of control of " clover disease ". This must be based, obviously on measures designed to prevent sheep from regularly eating excessive amounts of green subterranean clover. During the last three or four years many farmers have developed more mixed pastures for their sheep in order to avoid dominant green clover grazing. This has (quite naturally) produced no beneficial effects on their older and " affected " sheep but farmers who had previously suffered severe losses in their breeding flocks from this disease report marked improvement in their younger sheep which have been maintained under the modified system of management recommended. A very significant feature of the field evidence in the last two years has been the general low incidence of dystocia and prolapse even on properties which had suffered severely in the past.

If we accept the evidence that the content of the potent substance in green subterranean clover is not materially influenced by variety or soil, then obviously the only means of control of the disease short of completely removing the clover is by pasture and sheep management.

For a number of reasons which it is unnecessary to discuss in this article, subterranean clover is likely to remain an essential component of the pasture if a sound system of agriculture is to be maintained over the region under review.

Research work on the problem must continue until a complete understanding of the many at present obscure scientific aspects is worked out. This will include a further investigation of the possibility of producing less potent clover by the use of other varieties, or by manurial treatment or the like.

Whatever the results of these investigations it is strongly contended that appropriate modifications of husbandry practices, even if not 100 per cent. effective, will undoubtedly result in a much more productive system of farming with greater total returns that have been obtained on farms in the past where sheep have been grazed on more or less dominant pasture periodically topdressed with superphosphate.

PRACTICAL RECOMMENDATIONS.

1. Dominant clover paddocks should not be grazed in the green period. Such grazing can produce permanent effects in ewes and result in some ill-health and possible losses in wethers. Clover dominant paddocks can be reserved for summer grazing but are best utilised for meadow hay.

2. If the lambing percentage of a particular flock has dropped to very low figures, say 10–15 per cent., it is inadvisable to continue breeding from such ewes. The small percentage of lambs would be more than offset from possible losses from dystocia. It would be best either to keep them unmated solely for wool production or to sell them on the fat stock market.

3. Where the lambing percentage is about 40–50 per cent. it is suggested that at each tailing time all dry ewes be suitably raddled and later mated separately. Those which fail to lamb after this mating, that is after two consecutive matings, should be culled from the breeding flock and disposed of as indicated above. One farmer by such a programme, associated with appropriate pasture management, has improved his lambings from 30–35 per cent. to a normal 70–75 per cent. for the two lambings subsequent to culling.

4. A system of ley farming should be instituted on clover dominant areas with the dual objective of obtaining greater total productivity and a more balanced grazing for the stock. Wheat is very profitable at the present time and in most affected districts could be used as the first crop. This may be followed with advantage by a "scratched in" crop of oats and Wimmera rye grass using the sunderseeder or combine, and would provide a large bulk of good mixed winter and spring grazing. If the paddock is not grazed too heavily in late spring and early summer ample Wimmera rye grass seed should be set to provide a good mixed pasture in the following year.

5. Pasture improvement should be energetically pursued throughout the clover areas. This should include the introduction and encouragement of species other than clover, such as Wimmera rye grass. Good management of the pastures should

be followed with attention to such items as topdressing, the avoidance of overgrazing of the more palatable species, particularly during the seed setting stage, and periodic renovation with the use of "scratched in" crops of oats.

6. Baby beef production based on such breeds as the Aberdeen Angus, Red Poll or Beef Shorthorn could be developed with distinct advantage as one of the activities on many farms at present carrying only sheep.

TECHNICAL PAPERS ALREADY PUBLISHED.

"A Specific Breeding Problem of Sheep on Subterranean Clover Pastures in Western Australia."

H. W. Bennetts, E. J. Underwood and F. L. Shier—*Australian Veterinary Journal.*—Vol. XXII, Feb., 1946.

"Metaplasia in the Sex Organs of Castrated Male Sheep Maintained on Early Subterranean Clover Pastures."

H. W. Bennetts.—*Australian Veterinary Journal,* Vol. XXII, June, 1946.

"A Further Note on Metaplasia in the Sex Organs of Castrated Male Sheep on Subterranean Clover Pastures."

H. W. Bennetts.—*Australian Veterinary Journal,* Vol. XXII, January, 1947.

"Oestrogenic Action of Extracts of Subterranean Clover (Dwalganup)."

D. H. Curnow, T. J. Robinson and E. J. Underwood.—*Australian Journal of Experimental Biology and Medical Science,* Vol. XXVI (1948).

"Oestrogenic Effects of Subterranean Clover (Dwalganup): Protective Action of Androgen in the Castrate Male."

June East, E. J. Underwood and H. W. Bennetts.—*Australian Journal of Experimental Biology and Medical Science,* Vol. XXVII (1949).

"Oestrogenic Potency of Subterranean Clover (Dwalganup): The preparation and Assay of Extracts."

T. J. Robinson.—*Australian Journal of Experimental Biology and Medical Science,* 1949 (in press).

BACONER CARCASS COMPETITION.

M. CULLITY, Superintendent of Diarying.

THE Australian Meat Board inaugurated Baconer Carcass Competitions in 1948 in order to assist in reorientating producers' approach to the production of carcasses suitable for export.

Work of this nature was in hand by all authorities in Australia prior to 1939, but owing to the need during the war for all kinds of meat and fats in as great quantities as could be produced, emphasis on quality production lessened.

While there is still a huge demand for all kinds of meat in Great Britain, it is logical to look forward to the day when supplies will be more adequate and discrimination fully exercised by buyers, in respect to quality.

In the last few decades there has been a trend in consumer-demand towards smaller and leaner joints, with the natural consequence that extra large and fat carcasses have claimed lower prices than those providing cuts of the right size, with plenty of lean meat, balanced with a nice proportion of fat.

The Competitions were organised with the object of encouraging the production of the most suitable types of pigs, and of assisting the various State Extension Services in demonstrating what is needed.

A Committee, representative of the Board, the Pig Breeders' Society, the Bacon Curers, and the Departments of Commerce and Agriculture (Commonwealth), and Agriculture (State), was formed to supervise the organisation in W.A.

The State was divided into Zones (see map, page 109) and prizes offered in each Zone. A State Championship Award to the best entry in all Zones was offered also.

Each Competitor was allowed to make two entries comprising two pigs in each. For 1948 only, farmers were permitted to forward three pigs. All pigs were appraised according to the Smithfield System and the best two were taken as the entry.

Judging of the Competition was carried out on the Smithfield System (Breeders' points only), as devised by Messrs. H. R. Davidson, John Hammond, Jas. B. Swain, and Nevill L. Wright. The "Breeders' Points" only were used because nearly all killing and treatment was carried out at the one Works, and as the competition was for the farmer's part in producing the carcass any defects due to treatment and which would be penalised under "Marketing Points" could not be considered the responsibility of the farmer. Similarly the section for "Suitability of Carcass Weight" was ignored as a special weight range had been stipulated and entries falling outside this range were liable to disqualification.

For the benefit of past and future competitors in these competitions a description of the method of carcass appraisal is given.

The system was devised by English Pig Authorities to meet the requests from overseas countries for reports on the suitability of carcasses despatched to England. It was appreciated by overseas exporters that the trend in consumption-demand was towards joints with a high proportion of lean meat and a low proportion of fat. It was impossible to express with accuracy the characteristics of a carcass in these respects from a visual inspection of the carcass or a side.

Therefore the reporters mentioned above, realising not only the difficulties of accurately assessing quality of carcasses, but also the need for explicit reports, endeavoured to evolve a simple and uniform system.

Over a period of years they investigated the subject and, becoming increasingly aware of the inadequacies of visual judgment, endeavoured wherever possible to obtain a measurement to express a point so eliminating the variations due to the personal element.

In this way a scale of points was built up, which were intended to express as accurately as the guidance of innumerable dissections would permit, the value of a carcass in respect to its content of lean meat and fat.

There were three points, however, "hams," "shoulders," and "streaks," regarding which it was not possible to devise satisfactory standards of measurement. As a substitute photographic standards were prepared for comparison with the actual carcasses, as a means of minimising errors in visual appraisal.

The following is an extract from the investigators' report, describing the method :—

The scale of points and marks adopted for both pork and bacon is as follows :—

TABLE 1.

	Marks.	
	Porkers.	Baconers.
(1) Marketing Points—		
Colour—clean, fresh, white	5	5
Skin—smooth and fine	5	
Dressing—freedom from bruises and hair	5	5
	15	10
(2) Breeders' Points—		
(a) By Inspection :		
Hams—well filled and fine boned	8	8
Shoulders—light	7	7
Streak—thick, full of lean meat	12	12
(b) By Measurement :		
"Eye muscle" of Loin—thick	28	28
Back Fat thickness—correct proportion	20	20
Body Length—in proportion to weight	20	20
Leg Length—short	5	5
	100	100
(3) Suitability of Carcass Weight	....	15
Total Marks	115	125

The relative number of marks given to each point has been carefully considered according to the relative market value of the point. For example, a carcass poor in the "eye muscle," or thickness of lean meat, can drop many more points than one which is thick in the shoulders. The sum total of the points therefore represents the desirability of the carcass from a market point of view. The standard set is a high one, and any carcass which obtains over half marks on any point is a good one in that respect.

JUDGING BY EYE APPRAISAL.

STANDARDS FOR AWARD OR MARKS.

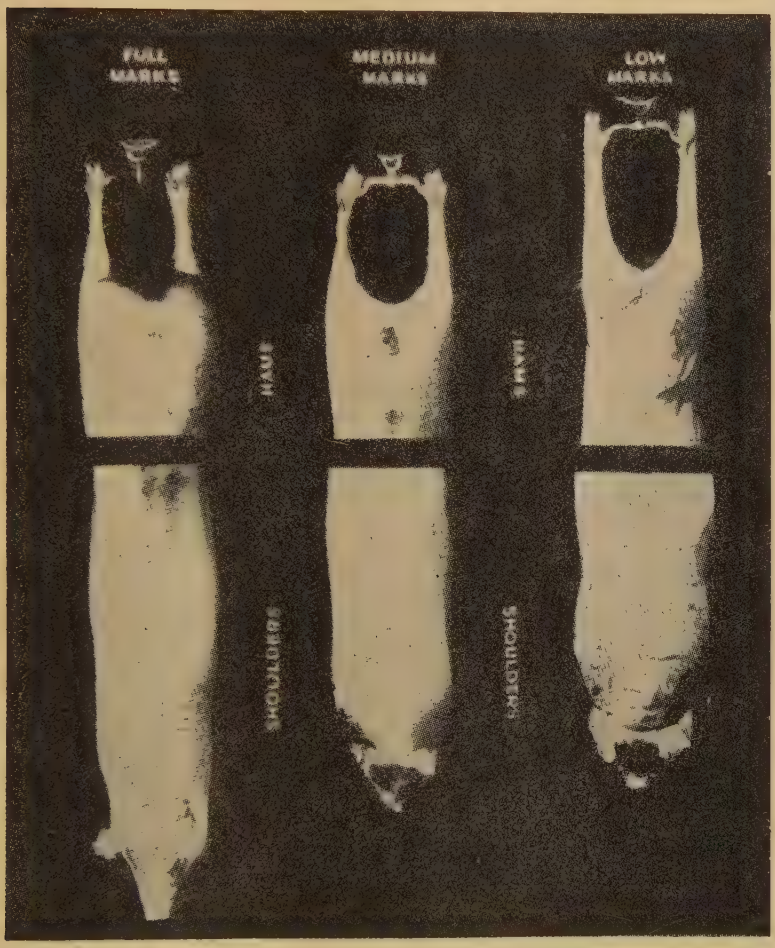


Fig. 1.

JUDGING IN THREE STAGES.

The judging is carried out in three stages :—

(a) The carcasses are weighed and are hung up in a row with their backs to the judge. The Marketing Points (Colour, Skin and Dressing) and the Hams and Shoulders of the Breeders' Points are then judged.

(b) Each carcass is then sawn down the middle line, and the Body Length and the Leg Length are measured with a tape measure graduated in millimetres.

(c) One side of each carcass is then sawn straight through at the level of the last rib, and the hinder ends are laid out in a row with the cut surfaces facing the judge. On the exposed cut surface the Streak is judged, and the "Eye Muscle" and Back Fat are measured by fine pointed callipers and read off on a wooden ruler scale in millimetres.

The level of the last rib has been selected to make this cut, for not only does it expose the most valuable part, but also the latest developing part of the carcass. A part which grows late during development of the animal forms the best index of the state of the development of the carcass as a whole.

STANDARD FOR AWARD OF MARKS. BY EYE APPRAISAL.

STREAK (BACONER).

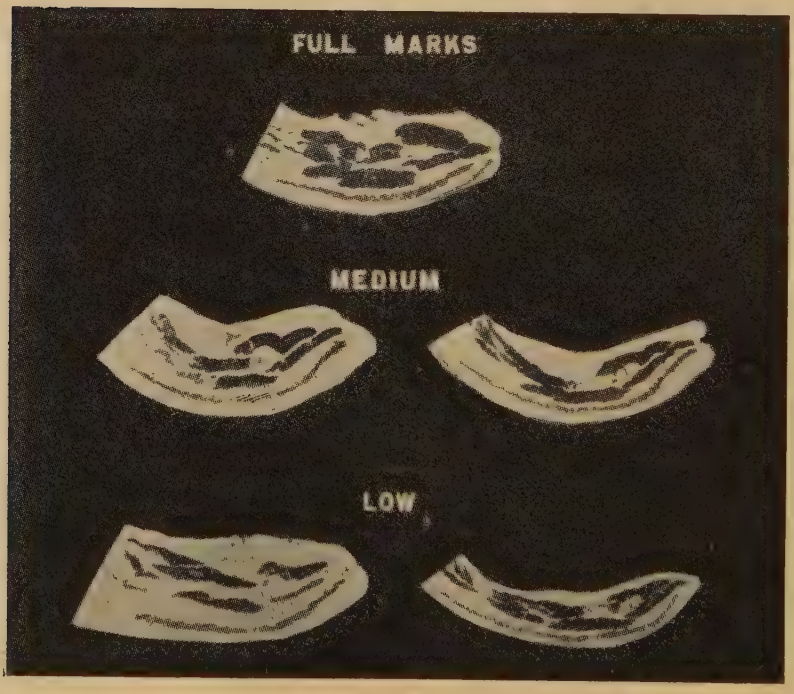


Fig. 2 (Bacon).

Where the method is employed for reporting to overseas senders rather than for carcass competitions in Great Britain, photographs of the carcasses arranged as described in paragraphs (a) and (c) above, together with the score card of the measurements and marks awarded, form a means of keeping a permanent record of the experimental consignment or competitions. In practice, these are sent back to the Government Departments, Recording Societies, Agricultural and Pastoral Associations, and producers concerned so that they can see for themselves in how far their pigs are meeting the demands of the consumer.

THE SCALE OF POINTS EXPLAINED.

A brief description of the points and the methods used in judging them is as follows :—

(1) *Marketing Points.*

Colour (5 *marks*).—The colour should be clean fresh white. Points should be deducted for dark colouration due to pigmented skin, sunburn before slaughter, or excessive drying in storage, as well as for the dead white blebs found as faults in cold storage.

Skin (5 *marks*).—The skin should be smooth and not too thick or coarse.

Dressing (5 *marks*).—Bruises and weals due to fighting before slaughter should be absent. There should be complete absence of all hair and absence of scraper cuts in the skin. The method of allowing the fore legs to hang naturally is preferable to hooking them back, as the latter makes the shoulders appear heavier than they are.

(2) *Breeders' Points.*

(a) *By inspection :* For these photographic scales are used (*see* pages 119 and 120).

Hams (8 *marks*).—The bone should be fine and the ham well filled out with lean meat, the space between the legs being U-rather than V-shaped. The hams to be judged are compared with the photographic scale of hams (Fig. 1) which shows the shape for maximum (8), minimum (1) and intermediate (4) marks, to be awarded.

Shoulders (7 *marks*).—These should be light in proportion to the rest of the carcass for it is a low-priced part. In judging, the shoulders are matched against a photographic scale of the shoulders (Fig. 1) which shows the shape for maximum (7), minimum (1) and intermediate (4) marks, to be awarded.

Streak (12 *marks*).—Not only should the belly be thick, but it should contain a high proportion of lean meat. Comparison with the photographic scale (Fig. 2) is made. The maximum marks (12) are given for a streak which is *both* thick and full of lean meat. The minimum marks (1) are given *either* for one which is thin, *or* for one which is thick but which contains a high proportion of fat. Illustrations of intermediate marks (6) in each case are also shown.

(b) *By measurement :* Measurement in millimetres rather than in inches (25 millimetres = 1 inch) has been adopted for the sake of greater accuracy and the avoidance of fractions. Since the actual measurement will vary with the weight of the carcass, Tables 2 to 5 have been drawn up for different wieght groups. From these tables the marks corresponding to any particular measurement can be read off. In the case of thickness of eye muscle and length of body, the highest marks are given for the maximum measurement, and in the case of the length of leg for the minimum measurement. For thickness of fat, on the other hand, as for suitability of carcass weight, the highest marks are awarded for an optimum measurement.

"*Eye Muscle*" *of Loin* (28 *marks*).—The thickness is measured half way along its width (*see* Fig. 3). This gives the best measure of the thickness of lean meat throughout the carcass. Different carcasses vary much more in the thickness than in the width of the muscle, so the thickness has been selected as the index of lean meat. The scale for converting measurements to marks is given in Table 2.

Back Fat Thickness (20 *marks*).—This is measured one inch for porkers and one and a half inches for baconers from the middle line, with one point of the callipers at the edge of the "eye muscle" and the other just on the inner layer of the skin (*see* Fig. 3). This gives a better measure of the amount of fat in the carcass than does the measurement of the fat at the shoulder, for it is the last part of the back fat to develop. Fat differs from all other points for marking, inasmuch as for each weight group of carcass there is an optimum requirement of back fat; there can be too little as well as too much. Consequently the scale for converting measurements to marks (Table 3) unlike the others, is extended on both sides of the optimum. In the case of pork, if the carcass is too fat the rind and the fat down to the required thickness has to be removed. It is therefore more profitable to supply this small

JUDGING BY AWARD OF MARKS FROM MEASUREMENT.

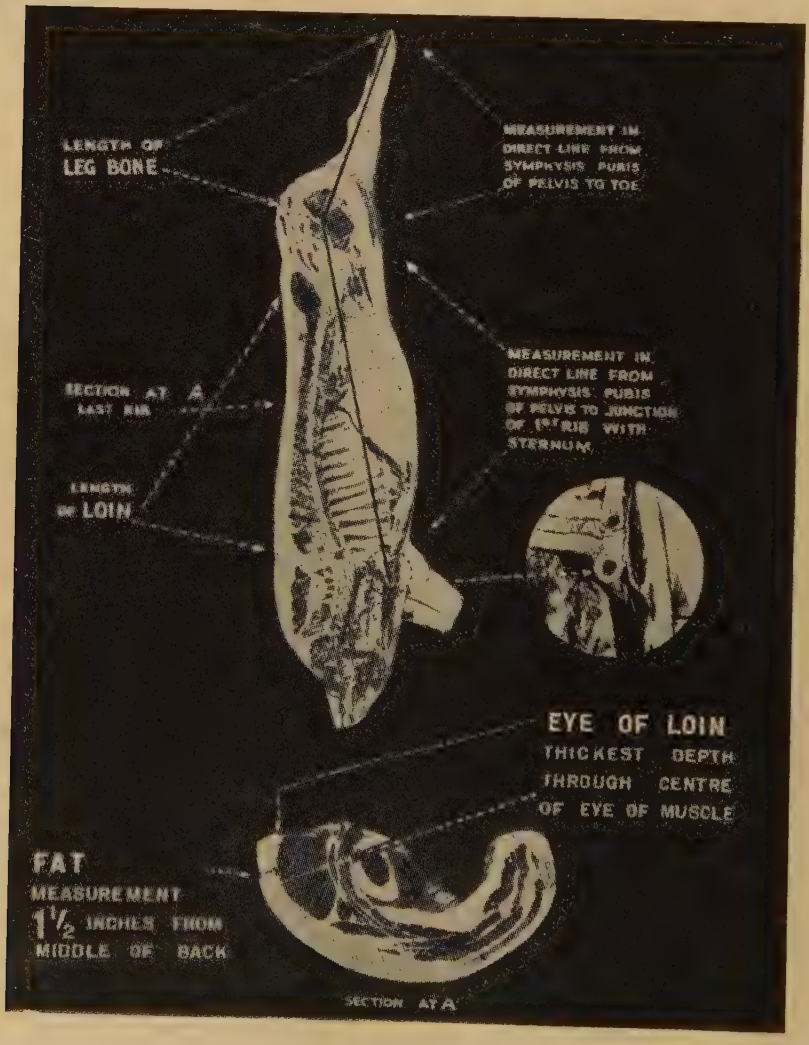

LENGTH OF LEG BONE
MEASUREMENT IN DIRECT LINE FROM SYMPHYSIS PUBIS OF PELVIS TO TOE
SECTION AT A LAST RIB
MEASUREMENT IN DIRECT LINE FROM SYMPHYSIS PUBIS OF PELVIS TO JUNCTION OF 1ST RIB WITH STERNUM
LENGTH OF LOIN
EYE OF LOIN
THICKEST DEPTH THROUGH CENTRE OF EYE OF MUSCLE
FAT
MEASUREMENT
1½ INCHES FROM MIDDLE OF BACK
SECTION AT A

Fig. 3.

pork, for which there is a growing demand in industrial areas, with the right amount of fat, so that it can be sold direct to the consumer with the rind on. At one time we considered the measurement of the thickness of the back fat from the point of the "eye muscle" farthest from the backbone to the skin, as it is here that the thickness of the fat shows up in the cut. Agreement was good when all measurements were taken by one person, but not when they were taken by different persons, for it is more difficult to judge the exact point at which the measurement should be taken here than in the place which we have adopted.

Body Length (20 *marks*).—This is measured with a tape measure from the edge of the symphysis pubis bone to the junction of the sternum with the first rib (see Fig. 3). It gives a measure of the length of the valuable loin joint which can be cut off the carcass. A high proportion of this to the weight of the carcass as a whole increases the value of the carcass for cutting purposes. The scale for converting measurements into marks is given in Table 4.

Leg Length (5 *marks*).—This is measured with a tape measure in a straight line from the edge of the symphysis pubis bone to the tip of the toe (*see* Fig. 3). When taken in relation to the weight of the carcass it gives a measure of the amount of bone in the carcass. The scale for converting measurements to marks is given in Table 5.

ONE OF THE CHAMPIONSHIP CARCASES.

Fig. 4.

ONE OF THE POOR CARCASES.

Fig. 5.

TABLE 2.

MARKS FOR THICKNESS OF EYE MUSCLE OF LOIN.

Measurements in Millimetres.

Carcass weight, lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 99	100 to 109	110 to 119	120 to 139	140 to 159	160 to 179	180 to 199
Marks													
1	23	24	25	26	27	28	29	30	31	32	33	34	35
3	24	25	26	27	28	29	30	31	32	33	34	35	36
5	25	26	27	28	29	30	31	32	33	34	35	36	37
7	26	27	28	29	30	31	32	33	34	35	36	37	38
9	27	28	29	30	31	32	33	34	35	36	37	38	39
11	28	29	30	31	32	33	34	35	36	37	38	39	40
13	29	30	31	32	33	34	35	36	37	38	39	40	41
14	30	31	32	33	34	35	36	37	38	39	40	41	42
15	31	32	33	34	35	36	37	38	39	40	41	42	43
16	32	33	34	35	36	37	38	39	40	41	42	43	44
17	33	34	35	36	37	38	39	40	41	42	43	44	45
18	34	35	36	37	38	39	40	41	42	43	44	45	46
19	35	36	37	38	39	40	41	42	43	44	45	46	47
20	36	37	38	39	40	41	42	43	44	45	46	47	48
21	37	38	39	40	41	42	43	44	45	46	47	48	49
22	38	39	40	41	42	43	44	45	46	47	48	49	50
23	39	40	41	42	43	44	45	46	47	48	49	50	51
24	40	41	42	43	44	45	46	47	48	49	50	51	52
25	41	42	43	44	45	46	47	48	49	50	51	52	53
26	42	43	44	45	46	47	48	49	50	51	52	53	54
27	43	44	45	46	47	48	49	50	51	52	53	54	55
28	44	45	46	47	48	49	50	51	52	53	54	55	56

TABLE 3.

MARKS FOR THICKNESS OF FAT OVER LOIN.

Measurements in millimetres.

Carcass weight, lbs.	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	170 to 179	180 to 189	190 to 199
Marks														
1	1	1	2	3	4	5	7	8	9	10	11	12	13	14
4	....	2	3	4	5	6	8	9	10	11	12	13	14	15
7	2	3	4	5	6	7	9	10	11	12	13	14	15	16
10	3	4	5	6	7	8	10	11	12	13	14	15	16	17
12	4	5	6	7	8	9	11	12	13	14	15	16	17	18
14	5	6	7	8	9	10	12	13	14	15	16	17	18	19
15	....	....	....	....	....	....	....	14	15	16	17	18	19	20
16	6	7	8	9	10	11	13	15	16	17	18	19	20	21
17	....	....	....	....	....	....	14	16	17	18	19	20	21	22
18	7	8	9	10	11	12	15	17	18	19	20	21	22	23
19	8	9	10	11	12	13	16	18	19	20	21	22	23	24
20	9	10	11	12	13	14	17	19	20	21	22	23	24	25
19	10	11	12	13	14	15	18	20	21	22	23	24	25	26
18	11	12	13	14	15	16	19	21	22	23	24	25	26	27
17	....	....	....	....	....	....	20	22	23	24	25	26	27	28
16	12	13	14	15	16	17	21	23	24	25	26	27	28	29
14	13	14	15	16	17	18	22	24	25	26	27	28	29	30
12	14	15	16	17	18	19	23	25	26	27	28	29	30	31
10	15	16	17	18	19	20	24	26	27	28	29	30	31	32
7	16	17	18	19	20	21	25	27	28	29	30	31	32	33
4	17	18	19	20	21	22	26	28	29	30	31	32	33	34
1	18	19	20	21	22	23	27	29	30	31	32	33	34	35

TABLE 4.

Marks for Body Length (Symphysis pubis to First Rib). Measurements in mms.

Carcass Weight lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	915 to 199
Marks																												
1	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820
2	555	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825
3	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830
4	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835
5	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840
6	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845
7	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850
8	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855
9	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860
10	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865
11	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870
12	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875
13	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880
14	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885
15	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890
16	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895
17	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900
18	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905
19	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910
20	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905	915

TABLE 5.

Marks for Leg Length (Symphysis pubis to Toe). Measurements in mms.

Carcass Weight lbs.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	195 to 199
Marks		and o	ver																									
1	450	460	470	480	490	500	510	520	530	540	550	560	570	575	580	585	590	595	600	605	610	615	620	625	630	635	640	645
2	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625	639 to 630	644 to 635
3	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625
4	429 to 420	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	554 to 545	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615
5	419	429 and	439 under	449	459	469	479	489	499	509	519	529	539	544	549	554	559	564	569	574	579	584	589	594	599	604	609	614

TABLE 6.

BACONER CARCASS COMPETITION, 1948.

Owner.	Breed.	Principal Feeds, etc.	By Inspection.				By Measurement.				
			Weight.	Ham.	Shoulder.	Streak.	Eye Muscle.	Back Fat.	Body Length.	Leg Length.	AV.
		ZONE 1.									
C. D. Pailthorpe, Pinjarra	Tamworth—(Tamworth × Berkshire)	Skim milk and pollard, some pasture	148.5	4.5	6	11.5	25	19.5	10.5	3.5	80.5
		ZONE 2.									
J. W. Hutchins, Northcliffe	Large White (Large White × Tamworth)	Skim milk and pollard with green feed	152	7.5	7	11.5	17.5	17.5	9.5	3	73.5
W. J. Moriarty, Capel	Tamworth—Canadian Berkshire	Pollard, crushed wheat, skim milk	134	7	4.5	10	21	18	9.5	3.5	73.5
C. A. H. and V. M. Heathcote, Northcliffe	Canadian Berkshire	Skim milk, pollard, crushed grain, green feed	170.5	5.5	4.5	11.5	22.5	18	7.5	3.5	73·0
J. T. N. Downes, Northcliffe	Large White	Skim milk, pollard, bran and pasture	163	7.5	5	12	14	18	9.5	2.5	68.5
Summerlea Pastoral Co., Capel	Berkshire—Crossbred	Skim and butter milk and crushed wheat	168.5	6.5	6	12	17.5	11.5	13.5	1.5	68.5
W. J. Moriarty, Capel	Tamworth– Canadian Berkshire	Pollard, crushed wheat, skim milk	123.5	6	5	11	15.5	17.0	8.5	3.5	66.5
E. J. Stapleton, Noggerup	Large White—Grade Large White	Skim milk, crushed wheat, grazing	162.5	6	5.5	9	13.5	17.5	11.5	2	65
S. C. Maidment, Balingup	Canadian Berkshire	Skim milk, crushed wheat, grazing	172	7	5.5	7.5	20.5	15.5	4	5	65
Summerlea Pastoral Co., Capel	Berkshire Crossbred	Skim and butter milk and crushed wheat	145	5	5	8.5	15	17	10.5	2.5	64
Alex. Poad, Dardanup	Tamworth—Large White	Pollard, bran, skim milk, wheat to top off	139.5	6	6	12	7	15.5	15	2	63.5
R. P. Reading, Vasse	Large White	Crushed wheat, skim milk and grazing	132.5	6.5	7	9	12	12	12	2.5	61
E. J. Stapleton, Noggerup	Large White—Grade Large White	Skim milk, crushed wheat, grazing	136.5	6	7	8.5	10	17	9.5	1.5	59.5
E. K. Evans, Jindong	Large White—Wessex Saddleback	Crushed wheat soaked in skim milk	134.5	6	6	9.5	14	11	8	2	56.5
E. K. Evans, Jindong	Large White– Wessex Saddleback	Crushed wheat soaked in skim milk	147.5	6	6	8.5	19.5	6.5	5	2	53.5
		ZONE 3									
A. K. Stirling, Kendenup	Berkshire	Skim milk, crushed wheat and grazing	153	8	4.5	8.5	21.5	18.5	14	5	80
A. K. Stirling, Kendenup	Berkshire	Skim milk, crushed wheat and grazing	127	8	4	9.5	18.5	19	15	5	79
F. R. H. Pugh & Son, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk, crushed wheat	145	7	5.5	9	23.5	19	6	5	75
L. M. Pugh, Narrikup	Tamworth, Berkshire	Milk and wheat, grazing	135	6	5	9	16	17.5	11	5	69.5
Research Station, Denmark	Berkshire	Buttermilk and crushed wheat	176	4	7	12	20	13.5	11.5	1	69.0
J. Pugh, Narrikup	Canadian Berkshire—Tamworth....	Milk and grain, grazing	126.5	5.5	6	12	12.5	17.5	9.5	5	68
Research Station, Denmark	Berkshire	Skim milk, buttermilk, crushed wheat	140.5	5	5	7.5	20.5	15.5	12	2	67.5
F. R. H. Pugh & Son, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk and crushed wheat	133.5	6.5	4.5	7.5	21.5	14	8	5	67
R. F. Pugh, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Milk and crushed wheat	146.5	6.5	4	10.5	20	17	1.5	5	64.5

L. M. Pugh, Narrikup	Canadian Berkshire (Tamworth × Berkshire)	Milk and wheat, grazing	144	6.5	3.5	9	17	15.5	7.5	5	64
F. Pugh, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Skim milk, crushed wheat	147.5	6.5	5	10	20.5	9	6	5	62
J. Pugh, Narrikup	Canadian Berkshire—Tamworth	Milk and grain, grazing	135.5	6.5	6.5	9.5	14.5	11	8	5	61
R. F. Pugh, Narrikup	Canadian Berkshire (Large Black × Tamworth)	Milk and crushed wheat	160	7.5	6	8	16	7.5	3	5	53
		ZONE 4.									
R. and J. Overheu, Brookton	Canadian Berkshire	Creep fed, crushed barley, oats, wheat and 10% meatmeal	166.5	6.5	5.5	9.5	15	16.5	14.5	3.5	71
R. and J. Overheu, Brookton	Canadian Berkshire	Crushed barley, oats, wheat and 10% meatmeal	136	6	5.5	8.5	13	18.5	12.5	2	66
W. G. Burges, Burges Siding	Canadian Berkshire	Crushed wheat and meatmeal	176.5	7	7	7	15	17	7	5	65
Muresk Agricultural College, Muresk	Berkshire	Wheat, barley, meatmeal, mineral supplement	141.5	7.5	2.5	10	16.5	12	7.5	5	61
W. G. Burges, Burges Siding	Canadian Berkshire	Crushed wheat and meatmeal	164.5	6	5	6	14.5	16	7	1	55.5
A. G. Marshall, West Pingelly	Tamworth (Tamworth × Berkshire)	Crushed wheat, oats, barley, meatmeal and skim milk	142.5	5.5	7	5.5	11	....	9.5	2	40.5
		ZONE 5.									
J. W. Moyses, Piesseville	Tamworth (Large White × Large Black)	Crushed wheat, oats and meatmeal green feed	153.5	7	7	10	18	5.5	3.5	3.5	54.5
		ZONE 6.									
Dunlop Tolerton, Kellerberrin	Large White (Canadian Berkshire × Large White)	Bran, pollard, whole wheat, green feed	146	5.5	6	10	21	16.5	14	3.5	76.5
Dunlop Tolerton, Kellerberrin	Large White	Bran and pollard, whole wheat, green feed	158	7.5	5.5	4	8	12	5	3	45

In the Competition conducted in 1948 there were 37 entries :—

Zone 1	1
Zone 2	14
Zone 3	13
Zone 4	6
Zone 5	1
Zone 6	2

This was an encouraging response, but with one disappointing feature. Of the 37 entries, 28 were received from dairying areas and only nine from the Great Southern Railway and wheat-belt districts.

As the pig industry generally may be considered to be divided almost equally between dairying and non-dairying areas, with some fluctuations from time to time due to varying prices of pigs and grain, the response from Zones 4, 5 and 6 were surprisingly low.

All entries were forwarded to Watsons Supply Stores' Bacon Factory, Spearwood, and the Albany Freezing Works. Carcasses from the latter were sent to Spearwood where judging was carried out on the October, 1948.

The Judges were Messrs. H. A. Watson, Fewster and M. Cullity, assisted by Mr. R. A. Paul.

A demonstration of the carcasses was held at the Bacon Factory on Thursday, 7th October. This was followed by the presentation of trophies by Mr. R. B. Williamson.

The State Championship was awarded to C. D. Pailthorpe of Pinjarra who was the only entrant in Zone 1. Details of the entries and the points scored in each section are given in Table 6.

DISCUSSION OF THE RESULTS.

1. *General.*

For the guidance of competitors who may be misled by what they consider the low-scoring of their pigs, it must be emphasised that it is exceptional for a carcass in any competition to score more than 80 points. The system of appraisal is designed having in mind the perfect carcass. In practice, a carcass scoring 60 points or more is considered excellent.

In this competition there were eight entries only which could not be considered to be of merit. Nine entries scored more than 70 points, with two over 80 points.

A comparison of points scored in this competition with those in similar competitions in Victoria and South Australia for 1948, indicates the average for this State was only very slightly below the others. A comparison of the best three entries shows that the average here was slightly superior. Even if allowance is made for possible variations in the allocation of points, particularly in the sections for visual judgment, the result cannot be other than reassuring for the breeders in this State and gratifying for those who have led in the efforts to improve the quality of West Australian pigs over the past twenty years.

2. *Breeds.*

An examination of the results has been made on two bases, firstly, according to the breed of the sire and, secondly, the actual breed or cross of the entry itself. The detail is shown in Tables 7 and 8.

It is appreciated that the sample of entries is too small to permit of the drawing of definite conclusions, but where there are indications at times supporting observations, it is considered advisable to make comment.

TABLE 7.

BACON CARCASS COMPETITION, 1948.

Average Percentages according to Breed of Boar.
Two Carcasses from each entry.

Breed of Boar.	No.	Weight.	Ham.	Sh'lder.	Streak.	Eye Muscle.	Back Fat .	Body Length.	Leg Length.	% Average
Maximum Points	....	....	8	7	12	28	20	20	5	100
Berkshire	42	151.2	80	72.5	76.7	63.7	76.2	44.3	78.1	66.6
Tamworth	14	139.4	75.0	82.6	82.1	57.9	66.4	48.1	65.7	64.0
Large White	18	147.6	83.0	86.6	76.8	54.3	67.1	45.0	52.8	62.2

TABLE 8.

PERFORMANCE OF BREEDS AND CROSS BREEDS.

Percentage of Maximum Points.

Breed.	No. of Entries.	Weight.	Ham.	Sh'lder.	Streak.	Eye Muscle.	Back Fat.	Body Length.	Leg Length.	Total.
Maximum Points	....	....	....	....	....	....	....	....	....	1,000
Berkshire pure breed	11	156.7	80.1	72.7	73.8	63.7	82.0	51.1	69.0	68.3
Berkshire × Tamworth	5	....	77.5	77.1	85.8	49.6	82.0	43.5	88.0	67.9
Berkshire × Tamworth × Berkshire	3	152.5	90.9	69.0	81.9	60.1	73.3	52.5	60.0	65.5
Berkshire × Tamworth × Lge. Black	5	146.5	85.0	71.4	75.0	72.5	66.5	24.5	100	64.3
Tamworth × Berkshire × Tamworth	2	145.5	62.5	92.8	94.4	64.2	47.5	50.0	55.0	60.24
Tamworth × Large White	1	139.5	75.0	85.7	100.0	25.0	77.5	75.0	40.0	63.5
Tamworth × Large White × Large Black	1	153.5	87.5	100.0	83.3	64.3	27.5	17.5	70.0	54.5
Large White × Berkshire × Large White	1	146.0	68.7	85.7	83.3	75.0	82.5	70.0	70.0	76.5
Large White × Tamworth × Large White	1	152.0	93.7	100.0	95.9	64.3	90.0	47.5	60.0	74.5
Large White × Large White × Unknown	2	149.5	75.0	89.3	97.0	41.9	86.2	52.5	35.0	62.2
Large White pure bred	3	151.0	97.9	83.3	69.4	40.5	70.0	44.2	53.3	58.2
Large White × Wessex Saddleback	2	141.0	75.0	85.7	75.0	58.0	43.75	32.5	40.0	55.0

It will be noted that there were 42 pigs, or 56.7 per cent. of the total submitted, sired by a Berkshire boar and that these scored higher with 66.6 points than the other two breeds which were represented. Tamworths with 18.9 per cent. of the entries averaged 64 points, while the Large Whites, with 24.4 per cent. of the entries scored 62.2 points.

In Table 8, further information is given of the performances of the various breeds and cross-breds. It will be noted that the two highest averages are credited to a Large White × Berkshire × Large White, and a Large White × Tamworth × Large White Sows. In each case, however, only one entry is represented and their performance is marred by the relatively unsatisfactory appraisals for the carcasses of the pure-bred and other Large White crosses.

The best performance was undoubtedly that of the pure-bred Berkshires, which scored an average of 68.3 points. An examination of the detailed score sheet (Table 6), will show that these carcasses scored consistently in each section and reference is made to points gained over various Berkshire crosses in the sections "back-fat" and "body length."

This is interesting in view of the total change in the character of the Berkshires in this State in the last twenty years, following the importation of Canadian and New Zealand improved strains, which characteristically had greater length than the type which it replaced.

The Berkshire-Tamworth crosses, the first-cross and the back-cross to the Berkshire, were only slightly inferior. There were no pure-bred Tamworths submitted so no direct comparison can be made, but reference can be made to the tentative conclusions from experimental work and earlier competitions that the quality of the good type improved Berkshire was not improved by crossing with the Tamworth. There is, however, the possibility which experience and observation tends to support, that the first-cross, in particular, grow more rapidly and more economically than either pure-bred. This may be due to hybrid vigor, but there is no experimental data to justify the conclusion.

3. *Carcass Quality.*

(a) *Visual Inspection.*—(i) *Hams.*—The average points scored were relatively high. There was considerable variation, however, in some cases the hams were unfinished and not filled out.

(ii) *Shoulder.*—The score also in this section was reasonably good. Most carcasses were well-formed and lean. In a few cases only was there any coarseness.

(iii) *Streak.*—The evaluation of the streaks showed generally good scoring. Layers of lean were interspersed with fat. Most streaks were thick enough.

(b) *Measurement.*—(i) *Eye Muscle.*—The measurements were in many cases surprisingly good. The weakest pigs in this section were certain of the pure Large White and their crosses.

It should be mentioned, however, that the best carcass for "eye muscle" was also a Large White-Berkshire-Large White cross.

Other combinations represented in two entries or more to score well were the pure Berkshire (11 entries), Berkshire × Tamworth × Large Black (5 entries), Berkshire × Tamworth × Berkshire (3 entries), and Tamworth × Berkshire × Tamworth (2 entries).

(ii) *Back-fat.*—Greater variation was apparent in this section. Good results were obtained with the Berkshire and Large White entries. The Tamworth crosses proved weakest in this measurement.

(iii) *Body Length.*—It is in this section that the entries fail to the greatest extent when compared to the ideal of the Smithfield system.

The best entries were Tamworth × Large White and Large White × Berkshire × Large White. Only 13 of the 37 entries succeeded in gaining 50 or more per cent. of the points in this section and it is worthy of note that 10 of the 13 referred to were Berkshire (6), or crosses with that breed. This is mentioned to indicate that while Berkshires are frequently criticised because of their lack of length, their actual performance was more consistent than the other breeds.

(iv) *Leg Length.*—Probably the greatest variation occurred in this section. Points allotted ranged from 20 to 100 per cent. of the maximum. The measurement of this feature, when considered with the weight of the carcass, has been shown to be an indication of the proportion of bone in the carcass. Little bone is desirable so that the proportion of edible parts may be greater. The best results were in the Berkshire and its crosses, which appeared to be far superior to the other breeds.

4. *Feeding.*

Competitors were asked to indicate the method of feeding as the quantity and kind of food supplied has considerable influence on the quality of the carcass.

The ideal bacon carcass has a high lean-meat-to-fat ratio, contained in a lengthy body with strong loins, full hams and light shoulders.

Bone and muscle or lean meat develops more rapidly than fat in the early stages of life, but as the pig approaches maturity, skeletal and muscle growth slow down and fat can be laid on more readily.

The best carcasses can only result when the pigs are fed adequate quantities of muscle and bone-building nutrients—that is a ration with a relatively high proportion of protein to carbohydrate, with the addition of minerals. The protein must also be of the right quality, regulated in West Australian conditions usually by including a proportion of skim milk or meat-meal.

Where early feeding is at too low a level, either in quantity or quality, the animal will reach maturity without having made satisfactory growth. Topping-off for market then results in weight gain, almost entirely from fat.

Carcasses from such pigs would probably score poor points on appraisal in respect of body length (short) ; back-fat (too much) ; eye muscle (not wide enough) ; shoulders (too fat) ; etc.

From the data provided by the competitors, it is apparent, as would be expected, that with few exceptions, the same feeds were used. Therefore the differences in the carcasses, where not due to breed and strain, are probably related to the use of the different components of the rations in varying proportions.

No comment can be made regarding the practice of individual competitors, nor of the feeding of any one entry, other than to suggest that too wide a nutritive ratio is probably responsible for some of the poorer quality carcasses. This is supported by at least one case, where on the data submitted, it is clearly shown that the proportion of protein used was less than half the necessary amount. The carcasses in this case were very poor indeed.

BETTER DAIRYING COMPETITION 1948-49.

M. CULLITY, SUPERINTENDENT DAIRYING.

FOR five years from 1931 to 1936 the Australian Dairy Council sponsored competitions under the above title. They facilitated the collection of data in the course of judging, which when assembled in a general summary provided a valuable survey of the level of dairy farming and of dairy farm practice.

The Pasture Improvement Committee of W.A., supported financially by the Australian Dairy Produce Board and the Rural Credits Division of the Commonwealth Bank, decided to revive this competition and offered substantial cash prizes in various zones.

The view of the Committee is that its function is to encourage better dairying practice and in particular greater production by improving pastures and by the adoption of efficient methods of utilising pasture including the conservation of surplus growth as hay and silage.

As previously, the Department of Agriculture supported the project fully and arranged judging by officers of the Dairy Branch.

No alteration was made in the boundaries of the Zones which were adopted previously, as these had been proved satisfactory, both for judges and competitors.

The map shows the location of the zones which were known as :—

Zone 1—Coastal.
Zone 2—Bunbury-Donnybrook.
Zone 3—Busselton-Margaret River.
Zone 4—Bridgetown.
Zone 5—Manjimup-Northcliffe
Zone 6—Great Southern.
Zone 7—South Coastal.

Cash prizes were offered in each zone as follows—

First — £20 and framed certificate.
Second — £12.
Third — £8.
Fourth — £6.

The following scale of points was adopted :

		points
1.	Conservation of Fodder and Summer Crops	300
2.	Pastures	240
3.	Dairy Herd	120
4.	Return of Butterfat, etc., per acre	120
5.	Pigs	30
6	Farm Management	140
7.	Utilisation of Skim Milk	50
	Total	1,000

Where a competitor sold his product in liquid milk form, the scale of points was adjusted so as to place him on a relative basis with competitors who supplied cream to a butter factory.

To facilitate judging this scale was expanded to the form shown with the results for each zone. As a number of judges were being used steps were taken to ensure as great uniformity as possible in allotting points.

Judging was carried out between November 30 and February 28. However, as pastures on most farms would be dry at this period, all farms were inspected during the Spring to make an assessment of pastures.

The detailed schedules of points allotted each farm are given in Tables 1 to 6.

No entry was received from Zone 6, for which it was intended that the competition would be for fodder conservation only.

POINTS GAINED BY COMPETITORS IN ZONE 1—COASTAL.

	Max. Points	Rosher, E.	Bassett-Scarfe Bros.	Cunningham, A.	Webb, E. M.	Pethwick, W.	Montgomery, M.	Temple, L. M.	Pailthorpe, J.	Murray, J.	Lukin, J.	Williams Bros.	Zeccan
1. Conservation of Fodder and Summer Fodder Crops: 300 points.													
(a) Hay. Quality, Condition	40	35	35	35	35	35	30	....	35	32	30	30	30
(b) Baling	10	....	10	10	....	....	....	....	10	....	....	....	....
(c) Silage. Quality, Type Wastage	25	....	10	....	20	22	....	....	20	....	....	....	....
(d) Summer Fodder crops, cultivation Disease, Yield	25	25	20	20	20	20	25	25	10	....	....	10	15
(e) Amount conserved per cow	200	169	200	200	200	125	200	90	104	140	80	144	64
2. Pastures: 240 points.													
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	110	125	110	100	110	80	125	85	80	55	65	65
(b) Management, Fertilsation	100	65	65	65	65	75	60	85	55	55	55	50	50
3. Dairy Herd: 120 points.													
(a) Dairy Type	50	45	40	45	40	48	48	45	40	40	40	45	40
(b) Condition	20	20	18	20	20	20	20	20	18	18	20	15	18
(c) Freedom from Disease	20	18	18	18	18	18	18	18	18	18	18	15	18
(d) Herd Sire— (i) Pure-bred	20	19	17	17	....	18	20	19	18	18	18	15	6
(ii) Ex tested Dam	10	9	5	5	....	....	9	10	....	6	9	7	2
4. Returns Per Acre: 120 points.													
(a) Butter Fat.....lb per acre	100	100	72	27	36	44	23	34	58	33	62	10	23
*Sidelines £.....per acre	20	2	....	1	....	....	....	18	....	....	 1	1	....
5. Pigs: 30 points.													
(a) Breed. Type and Condition	10	....	....	....	....	....	....	....	....	....	....	6	....
(b) Number of Breeding Sows in proportion to Milch cows	10	....	....	....	....	....	....	....	....	....	....	....	....
(c) Housing. Feeding and Management	10	....	....	....	....	....	....	....	....	....	....	4	....
6. Farm Management: 140 points.													
(a) Lay-out. Convenience, etc.	50	40	30	35	40	35	35	45	35	35	42	25	40
(b) Sanitation— (i) General	30	25	20	25	25	25	25	28	25	20	25	15	25
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	40	25	35	30	35	38	40	25	35	35	15	35
(c) Book-keeping and Records	20	20	18	10	20	18	14	20	15	15	10	5	10
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	....	....	....	....	....	....	....	....	....	....	18	....
Total	1,000	742	728	678	669	648	645	622	571	545	500	495	441
Adjusted—Supply of milk	....	807	791	737	727	705	701	676	621	592	544	495	479

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITION IN ZONE II.—BUNBURY-DONNYBROOK.

	Max. Points	Benson, R. C.	Bensted, & Co.	Frost, A. C.	Keall, E. D. C.	Crute, M. A.	Notron, J. P.	Fry M.C. & Sons	Edwards, P. P.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.									
(a) Hay. Quality, Condition	40	35	30	35	30	22	35	35	30
(b) Baling	10	10	10	10	....	....	10	10	....
(c) Silage. Quality, Type Wastage	25	....	....	....	....	....	....	....	....
(d) Summer Fodder crops, cultivation Disease, Yield	25	20	15	20	18	20	....	15	25
(e) Amount conserved per cow	200	177	200	146	134	172	44	80	....
2. Pastures: 240 points.									
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	110	90	115	105	90	120	110	105
(b) Management, Fertilisation	100	80	75	80	70	60	80	75	70
3. Dairy Herd: 120 points.									
(a) Dairy Type	50	48	45	45	45	45	45	45	40
(b) Condition	20	20	20	18	18	15	20	20	18
(c) Freedom from Disease	20	18	18	18	18	15	18	18	18
(d) Herd Sire— (i) Pure-bred	20	18	19	19	18	18	17	16	18
(ii) Ex tested Dam	10	3	10	9	10	4	....	3	....
4. Returns Per Acre: 120 points.									
(a) Butter Fat..... lb per acre	100	50	14	32	24	12	36	24	45
*Sidelines £..... per acre	20	1	4	7	14	5	20	4	....
5. Pigs: 30 points.									
(a) Breed. Type and Condition	10	8	8	9	9	8	8	8	....
(b) Number of Breeding Sows in proportion to Milch cows	10	10	5	1	10	8	5	2	....
(c) Housing. Feeding and Management	10	7	8	9	10	8	6	8	....
6. Farm Management: 140 points.									
(a) Lay-out. Convenience, etc.	50	45	45	45	40	40	35	35	35
(b) Sanitation— (i) General	30	25	25	25	25	25	20	25	25
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	38	35	35	40	35	25	25	35
(c) Book-keeping and Records	20	12	15	15	15	10	18	15	10
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	12	46	36	28	50	50	26	....
Total	1,000	747	737	729	681	662	612	599	474
Adjusted— Supply of milk	....	....	....	....	....	....	....	....	515

* Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE III.—BUSSELTON-MARGARET RIVER.

	Max. Points	Thompson, J.	Briggs, D. O.	Crookes, G. V	Smith, G. M. & Sons	Campbell, C. E.	Heath, C. N.	Butcher, W. N.	
1. Conservation of Fodder and Summer Fodder Crops: 300 points.									
(a) Hay. Quality, Condition	40	38	35	35	35	30	35	30	....
(b) Baling	10	....	10	5	10	10	....	....	....
(c) Silage. Quality, Type Wastage	25	....	18	....	....	....	....	....	....
(d) Summer Fodder crops, cultivation Disease, Yield	25	....	20	....	....	....	15	....	....
(e) Amount conserved per cow	200	200	200	200	200	110	100	95	....
2. Pastures: 240 points.									
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	135	115	122	120	118	105	110	....
(b) Management. Fertilisation	100	90	82	85	85	80	80	80	....
3. Dairy Herd: 120 points.									
(a) Dairy Type	50	48	45	50	45	40	40	40	....
(b) Condition	20	20	18	20	18	17	18	18	....
(c) Freedom from Disease	20	20	16	20	20	18	18	20	....
(d) Herd Sire—(i) Pure-bred	20	20	20	20	18	20	....	....	....
(ii) Ex tested Dam	10	9	8	6	8	....	....	....	....
4. Returns Per Acre: 120 points.									
(a) Butter Fat.....lb per acre	100	32	27	42	19	58	26	30	....
*Sidelines £.....per acre	20	18	13	15	20	17	11	8	....
5. Pigs: 30 points.									
(a) Breed. Type and Condition	10	10	8	8	8	8	7	8	....
(b) Number of Breeding Sows in proportion to Milch cows	10	8	8	10	8	8	8	....	....
(c) Housing. Feeding and Management	10	10	7	6	5	7	8	6	....
6. Farm Management: 140 points.									
(a) Lay-out. Convenience, etc.	50	47	40	50	40	40	40	40	....
(b) Sanitation—(i) General	30	30	25	20	25	20	26	30	....
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	40	25	30	35	20	35	30	....
(c) Book-keeping and Records	20	18	16	15	20	15	15	20	....
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	50	36	32	36	42	28	24	....
Total	1,000	843	792	791	775	678	615	589	....
Adjusted—Supply of milk	....	....	....	....	....	....	....	....	....

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE IV.—BRIDGETOWN.

	Max. Points	Maidment, S. C.	Dowrick, H. A.	Brennan, M.	Smith, F.	Daniels, H.	Moyes, H. S.	Williams, J. & M.	Ryan, K.	Richards, C.	Stapleton, E.	White, G.	
1. Conservation of Fodder and Summer Fodder Crops: 300 points.													
(a) Hay. Quality, Condition	40	34	35	34	31	34	30	24	26	....	10	....	....
(b) Baling	10	10	10	10	10	....	10	10	10	....	....	....	....
(c) Silage. Quality, Type Wastage	25	25	....	....	....	....	....	....	....	....	....	....	....
(d) Summer Fodder crops, cultivation Disease, Yield	25	....	....	....	....	....	....	....	....	....	....	....	....
(e) Amount conserved per cow	200	88	200	144	160	120	106	68	112	....	64	....	....
2. Pastures: 240 points.													
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	115	110	85	70	70	70	65	70	110	50	85	....
(b) Management, Fertilisation	100	100	74	60	60	62	50	56	50	65	40	65	....
3. Dairy Herd: 120 points.													
(a) Dairy Type	50	40	44	45	42	38	36	44	38	39	36	40	....
(b) Condition	20	18	18	19	18	18	17	17	16	19	16	18	....
(c) Freedom from Disease	20	15	18	19	18	18	17	18	17	16	15	19	....
(d) Herd Sire— (i) Pure-bred	20	18	20	18	20	18	15	19	17	17	20	19	....
(ii) Ex tested Dam	10	10	10	8	7	2	9	10	....	....	....	6	....
4. Returns Per Acre: 120 points.													
(a) Butter Fat.....lb per acre	100	26	22	55	16	24	23	12	33	40	8	39	....
*Sidelines £.....per acre	20	15	0.5	2	11	4	20	13	.5	12	10	0.5	....
5. Pigs: 30 points.													
(a) Breed. Type and Condition	10	8	....	....	....	7	7	9	....	6	7	....	....
(b) Number of Breeding Sows in proportion to Milch cows	10	7	....	....	....	5	10	8	....	2	8	....	....
(c) Housing. Feeding and Management	10	7	....	....	4	4	7	7	....	7	4	....	....
6. Farm Management: 140 points.													
(a) Lay-out. Convenience, etc.	50	40	40	37	30	32	35	42	35	39	35	37	....
(b) Sanitation— (i) General	30	28	28	27	28	28	20	29	25	28	20	22	....
(ii) Milking shed, Dairy, Dairy Utensils. and care of Cream and Milk	40	35	35	32	32	32	28	35	32	37	28	30	....
(c) Book-keeping and Records	20	20	20	16	15	15	15	17	15	14	17	15	
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	35	6	8	31	24	50	36	11	45	50	10	....
Total	1,000	69	690	619	603	595	575	539	507.5	496	438	405.5	....
Adjusted—Supply of milk	....	....	....	....	....	....	....	....	....	....	....	....	....

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE V.—MANJIMUP-NORTHCLIFFE.

	Max. Points	Bashford, J.	Angel, A. J. S.	Dorrel, R.	Beard, W.
1. Conservation of Fodder and Summer Fodder Crops: 300 points.					
(a) Hay. Quality, Condition	40	36	35	30	35
(b) Baling	10	....	....	10	....
(c) Silage. Quality, Type Wastage	25	18	17	....	....
(d) Summer Fodder crops, Cultivation Disease, Yield	25	....	1	....	....
(e) Amount conserved per cow	200	200	200	125	91
2. Pastures: 240 points.					
(a) Density. Condition, Freedom from weeds, Mixture, Drought Resistance, etc.	140	120	73	100	100
(b) Management, Fertilsation	100	90	59	80	85
3. Dairy Herd: 120 points.					
(a) Dairy Type	50	45	50	50	50
(b) Condition	20	20	20	20	20
(c) Freedom from Disease	20	20	20	20	20
(d) Herd Sire— (i) Pure-bred	20	20	20	20	20
(ii) Ex tested Dam	*U* 10	2	9	6	7
4. Returns Per Acre: 120 points.					
(a) Butter Fat.....lb per acre	100	46	26	42	54
*Sidelines £.....per acre	20	15	15	10	10
5. Pigs: 30 points.					
(a) Breed. Type and Condition	10	10	9	8	8
(b) Number of Breeding Sows in proportion to Milch cows	10	8	2	8	....
(c) Housing. Feeding and Management	10	9	9	....	9
6. Farm Management: 140 points.					
(a) Lay-out. Convenience, etc.	50	45	30	50	50
(b) Sanitation— (i) General	30	27	25	30	30
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	37	35	40	40
(c) Book-keeping and Records	20	20	15	20	19
7. Utilisation of Skim Milk: 50 points Based on number of pigs and calves fed	50	46	45	17	18
Total	1,000	834	715	686	666
Adjusted—Supply of milk	....	....	....	....	....

*Pigs, Poultry, Vegetables, etc.

POINTS GAINED BY COMPETITORS IN ZONE VII.—SOUTH COASTAL.

	Max Points	Bradford, W. L.	Pease, F.	Frost, W.	Tysoe, L.	Burkitt & Brown	Beaney, W. A.	Smith, W. J.	Jordan, L.	Wilde, W.	Killick, E.	Wilkinson, R.	
1. Conservation of Fodder and Summer Fodder Crops: 300 points.													
(a) Hay. Quality, Condition	40	35	32	32	30	35	35	32	32	....	30	36	....
(b) Baling	10	10	....	10	10	10	10	....	....	....	10	10	....
(c) Silage. Quality, Type Wastage	25	21	22	....	20	....	....	....	....	....	....	....	....
(d) Summer Fodder crops. Cultivation, Disease, Yield	25	....	21	....	....	....	....	....	....	....	....	15	....
(e) Amount conserved per cow	200	199	168	200	165	88	88	52	82	....	64	90	....
2. Pastures: 240 points.													
(a) Density. Condition. Freedom from weeds, Mixture, Drought Resistance, etc.	140	120	120	105	100	118	117	130	115	130	90	100	....
(b) Management, Fertilisation	100	90	95	90	90	90	91	95	90	96	80	75	....
3. Dairy Herd: 120 points.													
(a) Dairy Type	50	47	40	45	30	48	46	50	46	38	41	40	....
(b) Condition	20	18	18	18	17	19	18	20	18	18	15	17	....
(c) Freedom from Disease	20	16	15	18	16	17	17	20	17	17	15	17	....
(d) Herd Sire— (i) Pure-bred	20	20	20	20	20	20	20	20	20	20	20	....	....
(ii) Ex tested Dam	10	8	8	9	8	8	6	9	6	2	7	....	....
4. Returns Per Acre: 120 points.													
(a) Butter Fat ..... lb per acre	100	39	43	11	23	33	34	62	36	68	16	15	....
*Sidelines £..... per acre	20	20	18	17	15	18	13	10	16	14	10	10	....
5. Pigs: 30 points.													
(a) Breed. Type and Condition	10	8	8	8	8	8	8	7	....	8	5	7	....
(b) Number of Breeding Sows in proportion to Milch cows	10	8	8	8	10	2	10	....	....	8	....	8	....
(c) Housing. Feeding and Management	10	7	7	8	7	7	7	7	6	7	6	7	....
6. Farm Management: 140 points.													
(a) Lay-out. Convenience, etc.	50	25	30	45	42	48	40	40	40	42	45	20	....
(b) Sanitation (i) General	30	15	20	25	25	30	24	20	22	26	26	10	....
(ii) Milking shed, Dairy, Dairy Utensils, and care of Cream and Milk	40	25	20	32	30	40	32	35	30	34	35	10	....
(c) Book-keeping and Records	20	15	15	16	18	18	16	15	15	14	16	5	....
7. Utilisation of Skim Milk: 50 points. Based on number of pigs and calves fed	50	50	24	30	38	26	30	28	25	22	26	41	....
Total		796	752	747	722	683	662	652	616	564	557	533	....
Adjusted—Supply of milk	1,000	....	....	....	....	....	....	....	....	....	....	....	....

*Pigs, Poultry, Vegetables, etc.

DISCUSSION ON ASPECTS OF MANAGEMENT.

As indicated earlier, the Better Dairying Competitions in other years has provided material which permitted some appreciation to be made of the level of dairy farming in this State. While it is admitted that the general average of the competitor's farms are probably above the average for all dairy farms, it is believed that there is some justification for accepting and using the data as an indication of a reasonable level of efficiency and for portraying trends in farm husbandry. In the following notes, therefore, various phases of farm management will be discussed in relation to common measures of production or of farm practice. Further, it is appropriate that some comment be made indicating what is considered good practice so that the results may be viewed in proper perspective.

CONSERVATION OF FODDER.

A. General.

As the title of the Committee would suggest, its primary function is to assist in the improvement of pastures, but it has viewed its responsibility broadly, having in mind the reasons for its establishment, viz., to assist the farmer to obtain greater output from his property, thus giving greater economic stability and also to encourage the creation of greater national wealth by promoting increased production from the industry. In this competition therefore it has endeavoured to stimulate interest in efficient dairy farming. While at the same time emphasising the important place of pastures it realises that the feed given to the cow is the raw material from which milk is made, while the cow herself and other features of the farm provide the machinery and organisation. The importance of feed has been stressed by providing that the items in the scale of points relating to pastures, cropping and conservation together command 52 per cent. of the total maximum points.

A dense crop of meadow hay. G. V. Crooke, Cowaramup.

As climatic conditions in Western Australia do not permit, except in special localities, of a perennial type of pasture which would provide green grazing though the greater part of the year, but restrict pastures to an annual type giving from 6 to 8 months grazing according to district and season, management must provide supplementary feeding during the 4 to 6 months when no green pasture is available.

In addition, fodder is needed at other periods to supplement pasture growth. In an adequately fed herd maintained in production throughout the year, or in which each cow has a lactation period of nine or ten months, feeding of hay or silage is needed, commencing in November or December as the pastures approach maturity. This feeding should then continue at least into the early summer months with the possible addition of summer growing fodder crops. Where the majority of the herd has calved, in the early autumn, the amount of feed needed for milk production in the late summer will not be great, but for high yields it is essential that feeding of the cows approaching calving be continued on a high level as provision has to be made not only for maintaining the cows, but also to develop the calf and to build the primary tissues of the udder without which good milk flow is not possible.

At the break of the season, full supplementary feeding from reserves or fodder crops is equally as important, as at this period the amount of paddock feed is at its lowest. This improves in most districts till about the end of June in a normal season. From then till the end of July, or August in the more southerly districts, growth of pastures slows down owing to the cold and near waterlogged condition of many soils. Consequently the use of reserves is necessary till at least the beginning of August.

During these periods bulls, horses and young stock have to be maintained also and with the later there must be a margin for growth. The quantity needed for these purposes has been calculated as the equivalent of $2\frac{1}{2}$ tons of hay per cow. This supplies an adequate margin for the feeding of other stock usually found on a dairy farm. This quantity therefore has been used as the amount which would be needed by competitors to gain maximum points. Where silage or fodder crops were used, the total quantity of each was converted to an equivalent of hay. In cases where substantial areas of irrigated or other natural summer growing pastures were used, the total requirement for reserves would not be so great, and therefore the goal set for maximum points was reduced according to a predetermined scale.

B. Total Quantity Conserved.

The average amount of reserves of hay and silage and summer feed was :—

1.20 tons of hay
0.28 tons of silage
0–62 tons of green fodder.

This is equivalent to 1.52 tons of hay (three tons of silage or fodder being considered the equivalent of one ton of hay). There is a considerable reduction in the quantity of hay conserved per cow compared to earlier competitions, although there was a steady decline from 1932 to 1946. This will be seen in a study of the figures in Table 7. This is disappointing but the effect is offset to a degree by the fact that a considerable amount is now stored in bales allowing more efficient use and less wastage in handling and feeding.

It will be noted also that there has been a steady decline in the amount of silage which has been made.

TABLE 7.

Zones.	Total Cows	Hay	Silage	Green Fodder	Reserve per Cow			Reserve Per Cow Calculated as Hay
					Hay	Silage	Green Fodder	
1. Coastal—	608	822	347	767	1.35	0.57	1.26	1.96
E. Rosher	65	75	....	120	1.15	....	0.34	1.50
2. Bunbury-Donnybrook	269	308	....	272	1.12	....	1.00	1.45
R. C. Benson	31	42	....	16	1.35	....	0.51	1.48
3. Busselton-Margaret River	230	321	35	256	1.39	0.15	1.1	1.7
J. Thompson	39	60	....	....	1.54	....	....	1.54
4. Bridgetown	400	361.5	12	....	0.90	0.03	...	0.91
S. C. Maidment	73	61.5	12	...	0.84	0.16	...	0 88
5. Manjimup-Northcliffe	161	199	82	6	1.10	0.41	0.03	1.28
J. Bashford	36	58	20	....	1.61	0.55	....	1.75
7. South Coastal	286	340	81.5	78	1.18	0.28	0.27	1.33
W. L. Bradford	18	38	27.5	....	2.11	1.53	....	1.94
All Zones 1948–9	1,964	2321.5	597	1,379	1.20	0.28	0.70	1.55
1935–6	2,109	2.711	1,169	....	1.30	0.55	....	1.47
1934–5	1,550	2,232	1,307	264	1.43	0.84	....	1.77
1933–4	1,633	2,447	1,432	....	1.49	0.89	....	1.83
1932–3	1,531	1,854	1,784	....	1.21	1.16	....	1.64
1931–2	1,502	1,605	931	....	1.06	1.71	....	1.33

The total reserves in all Zones except Coastal were lower than in previous years and in no case was the Zone average two tons per cow. The highest was in the Coastal Zone where 1.96 tons per cow were conserved. The lowest was Bridgetown with only 0.91 tons. What may be surprising in these circumstances will be seen later in the relatively high yield per cow, but it must be remembered that the latter figures are for the season prior to judging, while fodder reserves which were measured were for future use.

Of the individual farms it is pleasing to record that there were several on which maximum points were awarded because there were 2¾ tons or more conserved for each cow on the properties, or a proportionately lower quantity where good summer pasture was available. These were as under :—

Zone 1—
- Bassett Scarfe Bros. .... Keysbrook
- Cunningham, A. .... Byford
- Webb, E. M. .... Cookernup
- Montgomery, M. .... Armadale

Zone 2—
- Bensted & Co. .... Dardanup

Zone 3—
- Thompson, J.* .... Bramley
- Briggs, D. O. .... Metricup
- Crooke, G. V.* .... Cowaramup
- Smith, G. M. & Sons* .... Jindong

Zone 4—
- Dowrick, H. A. .... Mullalyup

Zone 5—
Bashford, J.* .... Northcliffe
Angel, A. J. S. .... Jardee

Zone 7—
Frost, W. .... Kendenup

* Quantity for maximum points reduced owing to availability of summer pasture.

It is possible that labour shortage has contributed to the lesser amounts which have been conserved. If so it can be suggested that farmers make arrangements early for assistance or for the use of equipment from contractors which would reduce the calls on the time of those who are responsible for routine farm operations.

It is probable that the advocacy of early calving, that is, between March and July of each year, has contributed to the decline in the provision of silage, as some farmers believe that early calving will enable them to dry off their cows in the early summer and therefore silage would be of no value. If this is so, there are several fallacies in the thought. Reports of Grade Herd Recording show—(a) approximately 25 per cent. of the cows calve outside the optimum period;

(b) the average length of lactation in all units is too short;

(c) the proportion of cows completing a 273-day lactation in all units is small.

Therefore it is obvious that on the great majority of farms summer feeding is still necessary despite the endeavour to arrange early calving for the herd.

C. Hay.

The quantity of hay made for each cow was higher than in the first competition but lower than in the more recent ones. This probably is due to the change in farming routine which was forced on the farmers during the war owing to the lesser pasture

Loading clover hay. Margaret River.

growth following reduced topdressing rates, and to the shortage of labour for harvesting. The former aspect has since been rectified and the labour position is also better. There appears a tendency, however, on some farms to limit operations to what can be handled by the farmer himself. Despite the cost of additional help, either of manual or mechanical type, at the present higher rates, hay is still cheaper than any purchased feed. Hay cutting takes place at a period of the year when cash returns for produce sold are buoyant and few farmers cannot find the money to pay for the extra assistance.

Adequate quantities of hay can be obtained however only when planning for conservation is well ahead of the harvest period. Stocking must be adjusted to provide a sufficient surplus for cutting both as silage and hay. This involves care not to overstock the property, so that a sufficient number of paddocks can be closed early in the spring.

The trend to baling is pleasing from two aspects —firstly, it permits more efficient storage and use, that is less wastage, and, secondly, it indicates that mechanisation of harvesting is increasing.

The greatest quantity of hay per cow was conserved in Zone 3—Busselton-Margaret River where 1.39 tons were available. Comments by the judges on the quality of the hay were pleasing. Generally, cutting had been at the correct stage and the curing was good, nice colour and aroma being preserved. However, some cases were noted where cutting had been delayed and also where spoilage by rain or bad handling had occurred.

D. Silage.

Silage has the advantage of being succulent and palatable, but equally important, silage making can commence and end before the hay cutting season, thus enabling the one team of men to cut and conserve the growth from more acres. As the pastures are cut earlier than for hay, silage contains more protein which is specially valuable in the summer months when paddock feed normally is innutritious and unsuitable for maintaining milk yields. Silage can be made in all weathers, as rain will do no harm.

The provision of more modern harvesting and stacking equipment may eventually make the task of silage making practicable on a larger number of farms.

E. Green Fodder Crops.

On examination of Table 7 will show that the total quantity of green summer fodder crops provided was no greater than in any previous competition. This is not surprising in view of the labour requirements for cutting and feeding, and also the apparent growing objection to hand feeding of all kinds.

There has been little change in the position in any Zones other than a disappointing decline in Zones 4 and 5. The former has never been prominent for attention to this phase of dairying, while the latter has greater opportunities which are not being accepted.

The greatest quantity was provided in Zone 1 where 767 tons of green fodder were estimated to have been grown. These districts are those supplying milk to the metropolitan area and therefore there is greater need for keeping cows in milk during the summer.

TABLE 8.
ACREAGE OF GREEN FODDER PER COW.

Zone	No. of Cows.	Summer Fodder Acres.	Acres Sown per Cow.
1. Coastal	608	116·5	0·19
2. Bunbury-Donnybrook	269	44·25	0·16
3. Busselton-Margaret River	230	30·50	0·13
4. Bridgetown	400	....	....
5. Manjimup-Northcliffe	161	1·0	....
7. South Coastal	286	7·0	0·02
Total	1,964	198·5	0·10

There is ample scope for more attention to the growing of these crops, and it is certain from past experience that they can be grown satisfactorily when agricultural principles are complied with. Late ploughing and seeding cannot be expected to give good crops except in specially favourable localities, but early ploughing and cultivation, adequate fertilisation and sowing at the right time according to moisture conditions, have been proved to give profitable crops even in what is not considered summer land.

An estimate of the acreage of green fodder which is necessary to feed a cow in milk during the summer months may be made as follows :—

A normal daily ration of 40 lb. of green fodder would absorb approximately three tons in five months. An average yield of green crop satisfactorily grown is 10

A maize crop. Elgin, 1949. B. Vollrodt.

tons per acre. Thus approximately 0.3 acre per cow would be required. For ease of memory this may be translated to $\frac{1}{4}$ acre per cow. Where silage is provided the need for this quantity of green crop would be reduced.

The actual acreages sown in each Zone are given in Table 8 and it will be seen that in no case has the area sown approached the maximum requirements as estimated above. An examination of silage production does not suggest that silage plus green crops were sufficient in any Zone. It is estimated that three tons of silage per cow would be required to supply a normal ration to a cow during the five months December to May. If 1½ tons of silage and ¼ acre of green crop were provided it would have the same result. Table 7 shows in only Zone 1 was there more than ½ ton of silage per cow. Consequently the total provision of succulent feed of both forms was inadequate and this no doubt contributes largely to the short lactations and low yields to which attention is drawn in reports on Grade Herd Recording.

The acreage of various kinds of fodder crop grown is given in Table 9.

TABLE 9.

KINDS AND ACRES OF GREEN CROPS.

	Zone						Total
	1	2	3	4	5	7	
Sacchaline	60	....	....	....	....	....	60
Maize....	20	5¼	13¾	....	....	4	43
Melons	14	4	....	....	....	....	18
Swedes	....	....	10	....	....	....	10
Lucerne	8	8	....	....	....	....	16
Millet....	9	16	4	....	1	....	30
Elephant Grass	1½	....	....	....	....	....	1½
Sudan Grass	4	11	¾	....	....	3	18¾

Reference has been made previously to the reluctance of farmers to undertake summer cropping because of the labour involved, therefore some emphasis must be placed on the summer crops which can be grazed and which therefore once planted do not require more attention than pasture, other than a careful control of grazing. Crops which may be treated in this way are Sacchaline, Millet and Sudan Grass. Lucerne also can be grazed but this crop is too valuable to be used, other than very lightly, in this way.

Attention must also be drawn to the value of lucerne as a crop which supplies not only succulence but much protein of a very high quality for milk production. The difficulty of establishment, caused almost entirely by the ravages of lucerne flea and red mite has prevented many farmers from giving this crop the attention it merits. It is hoped that methods will be found of controlling these pests during the establishment period.

In the irrigation areas or where farm irrigation systems are available, spring planting is safe and gives relative security from insect attack. The protein value of this crop, and others such as cow peas, is such that it is ideal where summer milking is necessary and that is the case on every farm for at least a portion of the herd if good yields are expected. Protein is the most expensive of the essential food elements to buy. Fortunately in Western Australia clover hay and silage provide useful sources but these can be supplemented ideally by a protein rich fodder crop.

PASTURES.

A. *General.*

The Judges referred to pastures generally as being very good. In the Coastal Zone there were appreciable areas irrigated and in the Busselton-Augusta Zone summer moist conditions on several of the farms permitted perennial species to grow vigorously. In these cases the Judge stated that at the end of February these paddocks were quite vigorous.

The Judge in Zone 4, Mr. K. W. Simes, reported that there is a feeling among all farmers that pastures will need further great improvement if production is to be improved to any extent. Liberal applications of fertiliser were used and found successful in stimulating a greater bulk of feed. Only one competitor in this Zone applied less than one bag per acre ; the highest rate was 250 lb. This practice is in line with the recent results of experiments at the Wokalup Research Station where two cwts., per acre proved the most economical application.

The incidence of insect damage apparently was not great. No reference was made to any progressive endeavour by farmers to include higher yielding and more nutritious grass species in their clover paddocks although comment was made on the value of phalaris tuberosa and kikuyu grass perennial rye grass has been shown to to be of special value on the more southerly districts while good results from Wimmera rye are being obtained in all districts.

A good phalaris tuberosa subterranean clover pasture. Mrs. M. C. Fry and Sons, Donnybrook.

In view of the stated interest of farmers in the improvement of pastures it is disappointing that no record of efforts to improve the swards has been made. It is probable that the ease of establishment and maintenance of subterranean clover has contributed to a state of mind which does not acknowledge the need for re-seeding of other species when they tend to disappear. Experience has shown that re-seeding on occasion will result in the gradual building up of strains which will survive. The prolonged dry summer period tends to make the finding of several perennial species for pastures most difficult but phalaris tuberosa and kikuyu will survive in all dairying districts. Clunes strain of perennial rye grass appears to have a lower summer death rate than other strains, but severe reduction in stands will occur other than in selected moist situations of most farms. In the Margaret River, Northcliffe, and South Coastal districts it has little difficulty in surviving.

Perennial ryegrass with sprinkling of white clover. Peat swamp, Pardalup.

Little attention has been given in the past to the finding of an annual species which will grow in association with subterranean clover. Wimmera rye grass is suitable and merits greater use.

Subterranean clover sown on scarified sandy surface. Pardalup.

In the irrigation districts paspalum is the most aggressive species and most farmers knowing its tendency to invade, sow perennial rye grass and phalaris tuberosa with the expectation that these plants will assist in keeping the ultimate paspalum sward reasonably open. White clover is used universally as the legume balance.

No Judge made reference to the systematic harrowing of any pasture nor was there evidence of adequate control of grazing. The light cultivation or harrowing of pastures at the commencement of the season is recommended as also is the practice of chain harrowing after grazing to break up droppings.

Cow droppings—Chain harrowing to break droppings should be a part of routine pasture management.

The use of copper fertilisers is almost universal in the Busselton-Augusta Zone while many farmers in the Bridgetown-Manjimup and Denmark districts have also adopted the use of this fertiliser.

There was a pronounced increase in the average area used for dairying on each farm. The improvement was from 118.6 acres in 1934-5 to 144.1 acres in 1935-6 to 163.5 acres on the current competition. Therewas a corresponding increase in the herd size, the figures for the same three years being 27.7, 33.5, and 37.0 respectively (see Table 10).

B. *Carrying Capacity.*

Probably the best measure of the value of a pasture is the quantity of produce which is marketed from it. This is controlled by the level of management both in respect to the system of grazing, cultural treatment and fodder conservation. In fact all aspects of farm management will contribute to the level of yield but it can be expected that high production is impossible from poor pasture.

There are two methods of assessing the usage of pasture adopted in this competition, the stocking concentration and the yield per acre. The average stocking concentration expressed as acres utilised per dairy cow (or cow unit), is given in Table 10.

TABLE 10.

ACRES UTILISED PER MILCH COW.

	Average Number of Cows in Herd				Acres devoted to Dairying				Acres per Cow.			
	1948–49	1935–36	1934–35	1933–34	1948–49	1935–36	1934–35	1933–34	1948–49	1935–36	1934–35	1933–34
Zone 1	51	36·0	41·0	35·7	211·8	172·0	89·0	123·8	4·1	4·7	4·46	3·6
Zone 2	34	56·4	29·5	36·0	140·1	213·0	117·6	244·7	4·1	3·8	3·80	6·8
Zone 3	33	22·1	23·1	21·3	145·6	100·3	93·5	91·0	4·3	4·5	4·00	5·8
Zone 4	36	32·0	21·9	25·6	194·2	154·0	125·0	134·4	5·3	4·8	5·40	5·3
Zone 5	43	23·9	21·5	21·8	125·2	86·3	77·4	85·3	3·1	3·6	3·60	4·2
Zone 7	26	....	20·2	18·5	122·0	....	89·2	55·0	4·7	....	4·40	3·0
Average	37	33·5	27·7	26·3	163·5	144·1	118·6	126·7	4·4	4·3	4·14	4·7

It will be seen that there was no appreciable movement in the concentration of stocking since 1936. The result this year after a lapse of 13 years confirms the conclusion drawn from the previous competition that approximately 4½ acres were required per cow-unit under average conditions. It is interesting that this figure has again been obtained while there has been a change in the size of the average herd and acreage used for dairying among the entrants. In 1935–6 the average herd was 33.5 cows while in the present competition it has risen to 37 cows. This has been due partly to the inclusion of some large herds in Zone 1. The average acreage increased correspondingly from 144.1 to 163.5 acres.

There was a fall in the size of herds in Zone 2 from 1935-6, but an unusually high average was recorded for that year owing to the entry of a few large farms.

In Zone 3 the size of the herds is higher than ever before recorded. This is in line with the gradual development of more pasture and the rejuvenation of large areas following the use of copper fertilisers.

A similar trend is noticeable for Zones 4, 5, and 7 and suggest a movement to greater stability.

Zone 5 had the heaviest carrying capacity and the second highest output of butterfat per acre.

As indicated in reports for other years, it was decided to adopt a basis of acres per cow-unit as the measure of carrying capacity as likely to be more reliable than estimates of acres per head of stock and more simple than would be involved in attempting to translate carrying capacity to the equivalent of large stock. This latter method is useful but not so easily understood by all interested.

On a farm devoted to dairying, in addition to milch cows there will be a number of heifers—in calf—yearlings and calves—plus bulls and horses. These all have to be fed and so should be considered auxiliary to the cows. Most farmers rear their own replacement stock and therefore apart from variations in the incidence of

disease the proportion of young stock to cows should be relatively constant from farm to farm. In the estimate used in previous reports it was suggested a 20-cow farm or 20-cow unit would contain 50 head as under.

Stock on farm supporting 20 cows.

20 cows
9 Heifers 2 year old.
9 Heifers yearlings.
9 Heifers calves.
1 Bull.
2 Horses.

50

Data collected by Judges has shown that this basis is a little more liberal than is the case on the farms under review.

The composite figures for all farms were :—

Cows	1,964
Heifers	706
Calves	1,046
Bulls	80
Horses	100*
	3,896

* Not recorded. Estimate only.

It follows from the above that while the carrying capacity in terms of cow units was 4.4 acres. It was equivalent to 2.2 acres per head of all classes of stock. In terms of equivalent of large stock it is estimated to be 3.1 acres. This confirms the usual assessment of the value of average dairying land and justifies confidence in the relative accuracy of the data collected.

DAIRY HERDS AND PRODUCTION.

This section was intended to give some idea of dairy type and the condition of the herds, but it appears little value can be expected from a simple allocation of points on inspection, particularly where more than one judge is operating. Further, the impossibility of deciding the value of a cow, or a herd on inspection while ignoring the influence of feed and management on the appearance of the animals, emphasises the desirability of adopting an amended system which will be a measure of the cows, capacity under the existing system of management.

The Judges' assessments of quality in all zones were high; in fact, it appears that there was too liberal treatment of most herds. This, however, does not discount their considered opinion that the herds were of merit. No data were collected regarding breed other than so far as the breed of the herd sire would indicate the breed of the herd. This was the case on nearly all farms.

In discussing the herds therefore one can only consider their actual yields during the period of the competition. These can be considered first on the basis of the actual performances of the herds per cow and then their effectiveness in giving larger output per acre.

A high yielding Jersey herd. G. V. Crooke, Cowaramup.

A. *Production Per Cow.*

The average yield was higher than in any previous competition as indicated by Table 11.

Table 11.

AVERAGE YIELD PER COW.

Year	Number of Cows	Average yield per cow Butter-fat.
1948–49	1,964	232·9
1935–36	2,109	212·0
1934–35	1,550	192·7
1933–34	1,663	208·8
1932–33	1,531	201·5

This result is particularly pleasing as it can be interpreted as meaning a rise in average herd quality and a corresponding lift in the level of management.

The results in the individual zones, together with information regarding the highest producing herd in each zone is given in Table 12.

TABLE 12.

AVERAGE PRODUCTION PER COW IN EACH ZONE TOGETHER WITH THAT OF THE HIGHEST PRODUCING HERD.

Zone	Number of Cows	Average in Herd	Average Butterfat per Cow	1935–36
1. Coastal	608	51	270	233·4
Bassett-Scarfe	....	104	376	
2. Bunbury-Donnybrook	269	34	203·8	205·0
R. C. Benson	....	31	250	
3. Busselton-Margaret River	230	33	235·8	260·0
G. V. Crooke	....	21	390	
4. Bridgetown	400	36	220·8	229·1
M. Brennan	....	30	287	
5. Manjimup-Northcliffe	161	43	214·3	179·6
R. Dorrell	....	40	244	
7. South Coastal	286	26	214·4	
W. J. Smith	....	23	343	
Average all zones	1,964	37	232·9	212·0

The best performance was that of Mr. G. V. Crooke of Cowaramup whose herd of 21 high grade Jerseys gave an average of 390 lb. Another very good result was that of Messrs. Bassett-Scarfe's mixed herd which gave a yield of 376 lb. This is a particularly meritorious performance because of the large size of the herd which comprised 104 cows. Both herds were very well fed, the former having access to more than one acre per cow of summer pasture, and the latter over an extensive area of Sacchaline. Plenty of hay was also available while 150 tons of silage was provided on Messrs. Bassett-Scarfe's property.

Mr. Crooke's herd is of high quality Jerseys and was in excellent condition. The herd has been under test for some years. Mr. Crooke follows carefully the policy of having his cows calve early. Only four were in milk in March, 1948; 12 in April and 19 in May. The other two cows calved in June and July, and the 21 were still in milk in December last and were to be kept in production in the following months. Thus Mr. Crooke has the ideal method for achieving high yields. That is—good cows, good pasture, plenty of conserved fodder and good management, including early calving. The produce as sold is cream for buttermaking.

Messrs. Bassett-Scarfe's herd is used for milk production for the metropolitan area and is maintained in milk throughout the year. Feeding is heavy with good pastures as a base, supplemented with ample hay, silage, green crops and concentrates.

Mr. W. J. Smith's herd of pure bred Guernseys in the Denmark district also gives very high yields. The 23 cows averaged 343 lbs. Excellent pastures are available while approximately one acre of summer growth per cow assists in maintaining summer flow. All cows are machine stripped, and are remarkably free of all disease. Individual animals in this herd have produced over 600 lb fat, while a junior two year old heifer under official test made a record of 510 lb during the past year.

The heifer becomes the cow. Heifers intended for the War Service Land Settlement Scheme.

Other performances worthy of note are set out in Table 13, which gives details regarding the herds which averaged over 250 lbs.

TABLE 13.

HERDS PRODUCING MORE THAN 250 LBS. BUTTERFAT PER COW—1948-49.

Owner.	Zone	Number of Cows in Herd	Production of Butterfat per Cow
Crooke, G. V.	3	21	390
Bassett-Scarfe	1	104	376
Smith, W. J.	7	23	342
Lukin	1	38	335
Murray	1	24	325
Cunningham	1	45	308
Pethwick	1	50	305
Campbell, C. E.	3	30	293
Brennan, M.	4	30	287·3
Montgomery	1	25	285
Dowrick, H. A.	4	30	268·7
Wilde, W.	7	28	265
Richards, C.	4	34	264·5
Thompson, J.	3	39	259
Rosher, E.	1	65	257
Benson, R. C.	2	31	250

It is interesting that of the seven herds producing more than 300 lbs fat per cow, five were in Zone 1 and supply whole milk to the metropolitan area.

As these latter competitors are interested in cow yields measured in gallons, rather than in pounds of butterfat, and also as the measurement of the performances

of their herds was in gallons, and later converted into pounds of butterfat, the following details of average milk yields in Zone 1 will be of value. The data in Table 14 shows that high average yields can and are being obtained in the milk zone. The results are a credit to the farmers concerned, and are proof of the high degree of efficiency with which their herds and their properties are being managed.

TABLE 14.

HERDS' SUPPLY WHOLE MILK, ZONE 1—AVERAGE YIELD OF MILK PER COW.

Name	Cows	Total Yield	Average Yield
E. Rosher	65	41,190	633
B. Scarfe	104	96,382	927
A. Cunningham	45	33,541	745
E. M. Webb	27	13,290	492
Montgomery	25	17,215	688
W. Pethwick	50	37,893	758
C. Zeccan	65	31,888	490
J. Pailthorpe	70	36,957	528
J. Murray	24	18,865	786
Lukin	38	31,664	835
	513	358,885	700

A comparison of average milk yields in Zone 1 for various years is also given in Table 15, and shows an upward trend.

TABLE 15.

COASTAL—ZONE 1.

Year	Average Yield
	Gallons
1948–49	675
1935–36	583*
1934–35	540*
1933–34	552*
1932–33	414*

*Converted from butterfat averages, as published for earlier competitions, to a 4% milk.

B. *Production Per Acre.*

On any farm the movement in the yield per acre is in direct proportion to the movement in total output from the property unless more acres are being brought into use. While the per acre results are no indication of the economic stability of a farm they can be used in comparing the efficiency of management of properties of about equal size operated under similar conditions.

Some details are given in Table 16 showing the yields in the various Zones compared to the leading farm in each. It will be seen that the average of 52·6 lb. is slightly higher than in 1935–36. The improvement however is not consistent in all zones.

TABLE 16.

AVERAGE PRODUCTION OF BUTTERFAT PER ACRE COMPARED WITH THAT OF THE LEADING FARM IN THIS RESPECT.

Zone	Acres used for dairying each farm	Cows Average Number each farm.	Butterfat Produced per Acre					
			1948–9	1935–6	1934–5	1933–4	1932–3	1931–2
1. Coastal	211·8	51	64·5	48·9	47·0	61·6	34·8	53·4
E. Rosher	....	....	172·0	....	....	....	....	....
2. Bunbury - Donnybrook	140·1	34	49·0	54·1	57·7	32·8	46·6	50·4
R. Benson	....	....	86·1	....	....	....	....	....
3. Busselton-Margaret River	145·6	33	53·2	57·3	54·9	46·6	43·6	37·9
C. E. Campbell	....	....	99·0	....	....	....	....	....
Bridgetown	194·2	36	41·6	56·0	42·9	35·7	40·7	35·1
M. Brennan	....	....	93·7	....	....	....	....	....
5. Manjimup - Northcliffe	125·2	43	66·3	49·7	49·0	46·0	38·8	35·5
W. Beard	....	....	92·3	....	....	....	....	....
7. South Coastal	122·0	26	45·7	....	58·1	70·0	49·4	45·4
W. Wilde	....	....	117·0	....	....	....	....	....
Average All Zones	163·5	37	52·6	50·3	48·6	43·8	42·6	43·0

Earlier comments drew attention to an increase in the areas used for dairying. This combined with a maintained acre output means considerably higher farm outputs.

The highest result was obtained in Zone 5 where a figure of 66·3 lbs. was recorded. The winning entrant, Mr. J. Bashford, produced 79 lbs. fat per acre. Mr. W. Beard, however, was the more successful in this section as the yield from his property was calculated as 92·3 lbs. per acre.

Zone 1 had the next highest average 64·5 lbs. In this district nearly all entrants are producers of whole milk and their figures in gallons were converted to butterfat on a four per cent. basis. The leading farm, that of E. Rosher, gave the excellent return of 172 lbs. of fat, or 430 gallons per acre. Mr. Rosher purchases a considerable amount of fodder for his stock; this is necessary as his herd of 65 cows has only 95 acres of grazing. The performance is most meritorious and it proves a high level of farm and herd husbandry.

The following list contains the names of th ose whose yields were above average :—

E. Rosher, Bassendean	172 lbs.
Bassett-Scarfe Bros., Keysbrook	123 lbs.
W. Wilde, Hazelwood	117 lbs.
J. Lukin	107 lbs.
W. J. Smith, Denmark	105 lbs.
C. E. Campbell	99 lbs.
M. Brennan, Balingup	93·7 lbs.
W. Beard, Manjimup	92·3 lbs.
R. Benson, Upper Capel	86·1 lbs.
P. Edwards, Waterloo	77 lbs.
F. Pease, Torbay	73 lbs.
R. Dorrell, Manjimup	72 lbs.
G. V. Crooke, Cowaramup	72 lbs.
C. Richards, Warner Glen	69·1 lbs.
J. Thompson, Bramley	69 lbs.
W. Bradford, Denmark	67 lbs.

As more suppliers of whole milk are represented in the present competition it is of interest to record the average yield of milk per acre. This is 161 gallons per acre. The best performance was that of Mr. Rosher with 430 gallons per acre, and he was followed by Bassett-Scarfe Bros., with 308 gallons.

An examination of the data was made to discover whether there was any indication of a relationship between stocking concentration and yield per acre. A scatter diagram of the individual farms did not disclose any significant trend. A comparison of the stocking concentration and per acre output in each Zone is given in Table 17. As will be shown later, however, there does appear to be some relationship between cow and acre yields. The number of farms examined is of course too small to permit the drawing of any conclusions except where the relationships are particularly well defined.

TABLE 17.

BETTER DAIRYING COMPETITION—1948-49.

Zone	Acres utilised per milch cow	Average production of Butterfat per acre
Zone 1	4·1	64·5
Zone 2	4·1	49·0
Zone 3	4·3	53·2
Zone 4	5·3	41·6
Zone 5	3·1	66·3
Zone 7	4·7	45·7
All Zones	4·4	52·6

It is considered that the movement in the average output of butterfat or milk per acre is the best available indication of trends in the efficiency of dairy farming. The sample of farms is small and therefore apparent violent fluctuations in the figures may occur from year to year, but over a period of years the indications may be accepted as reasonably reliable.

A well constructed dam supplying stock and houses. Rooney Bros., Glen Warren, Manjimup.

The data already given shows that the average for this competition is the highest on record.

In Table 16 details of yields per acre in all Zones for all competitions are given.

An examination of the figures in this competition shows that there is an upward trend in butterfat per acre as cow yields rise. For obvious reasons this rise is not uniform but over the number of farms there does appear to be a correlation. This lends point and support to the contention that one of the easiest ways to increase total production is by raising cow yields. It is admitted that high per acre yields can be achieved with low production per cow where stocking concentration is dense, but it is clear that similar results could have been obtained with fewer cows of higher capacity and at a lower labour and feed cost. The ideal seems to be high cow yields, which combined with heavy stocking must result in high per acre production.

However, an attempt to stock heavily with this end in view would lead to disaster, and farmers are advised to plan within the present carrying capacity of their farms, and strive towards higher yields from the cows. As husbandry improves it will probably be found that stocking concentration can be increased. In other words the degree of stocking is set, partly at least by the efficiency of farm management.

In table 18 is given the names of those farmers who produce more than 100 lbs. fat per acre, together with some information regarding the stocking of their properties. The acreages refer to the areas used for dairying exclusive of any other class of livestock.

TABLE 18.

HERDS OVER 250 LBS. FAT PER COW AND 100 LBS. FAT PER ACRE.

Name	Yield per acre	Yield per Cow	Acres per Cow-unit	Acres per equivalent large beast
	lbs.	lbs.		
E. Rosher	171	257	1·3	1·0
Bassett-Scarfe Bros.	123	376	3·2	2·2
W. Wilde	118	265	2·3	2·0
J. Lukin	107	337	3·1	2·0
W. J. Smith	105	343	3·2	1·6

C. *Bulls.*

Of a total of 80 bulls on competing farms 74, or 92.5 per cent. were pure bred. Of the grade bulls, three were in herds in Zone 1, the milk area, but these herds had also one or more pure bred bulls. In the other Zones (butterfat herds) 94.5 per cent. of the bulls were pure bred.

The distribution according to breed in Zone 1 and other Zones is shown in Table 19.

TABLE 19.

BULLS IN HERDS WERE PURE BRED BULLS ONLY.

Breed	Zone 1	Zones 2, 3, 4, 5 & 7	All Zones
A.I.S.	4	12	16
Jersey	2	12	14
Guernsey	1	12	13
Fresian	1	1	2
Red Pole	1	....	1

It is evident from the comments of the Judges that farmers acknowledge the value of good bulls, but it is disappointing that of the 74 pure bred bulls in use 60 were from untested dams. All farmers are now aware that the only sure indication of a sire's real value is in the performance of his progeny. In the absence of sufficient data to judge an animal in this way, the next best method is to select a son of a proved bull from a good cow, or at least from a known line of high producers. The figures for all herds indicate that the herds with pure bred standard bulls only and including 1,606 cows averaged 239·2 lbs. butterfat which is above the average for all herds. It follows that herds with pure bred bulls from untested cows or with grade bulls, would yield much lower—in fact 204 lbs. only.

UTILISATION OF SKIM MILK.

As the majority of farmers in this State are supplying cream to butter factories they have a quantity of skim milk for use at home. An attempt was made to measure the efficiency of its use by allocating a maximum of 50 points, where calves or pigs were fed in sufficient numbers. All Judges were provided with a schedule for calculating calf or pig months. This is an abitrary scale but serves as a useful means of assessing the level of skim milk feeding and has proved easy in application.

The schedule is as follows :—

Calves	5	months	feeding.
Baconers	5	do.	do.
Porkers	3	do.	do.
Slips	2	do.	do.
Weaners	1	do.	do.

Maximum points were awarded when 12½ feeding months per cow were obtained. For each feeding month under 12½ a deduction of four points was made.

In all Zones for 1,964 cows, 962 calves and 1,725 pigs including 115 sows were fed.

Excluding all farms from which milk is supplied either to the metropolitan area or to cheese factories the figures were :—

1,166 cows ; 732 calves ; 1,631 pigs including 113 sows.
In the milk producing farms the position was :—
798 cows ; 230 calves ; 94 pigs including 2 sows.

Details of the position in each Zone is given in Table 20.

TABLE 20.

UTILISATION OF SKIM MILK.
Number of Calves and Pigs Fed.

Zone	Cows	Calves	Pigs excluding Sows	Sows	Total Calves and Pigs	Ratio Calves and Pigs to Cows
Zone 1	608	153	55	1	208	0·34
Zone 2	209	180	348	24	528	2·5
Zone 3	230	184	295	25	479	2·1
Zone 4	400	265	324	31	589	1·5
Zone 5	161	32	225	9	257	1·6
Zone 7	286	148	363	25	511	1·8
All Zones total	1,964	962	1,610	115	2,572	1·3

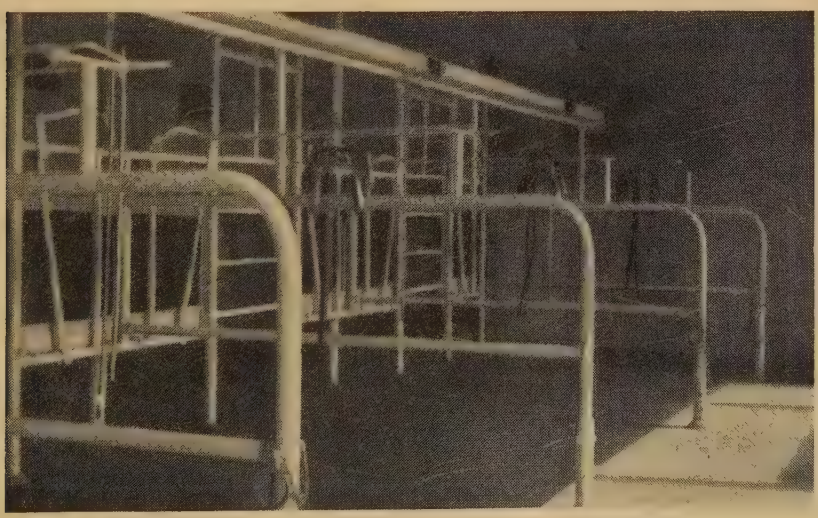
Rearing of Young Stock.—Some pleasure can be expressed at the number of calves which are being reared for herd replacement. It is considered that 50 per cent. of all heifer calves should be retained for replenishing losses due to wastage, i.e., culling, death and sales. This represents 25 per cent. of all calves dropped. This figure allows a margin for losses in rearing and for the sale of a few surplus, young animals.

These are necessarily average figures and as a guide to the individual farmer who may not get a calf from every cow or may not have an even drop of heifers and bulls. The requirements for herd replacement may be stated as calves equal in number to 25 per cent. of the herd size.

The figures in Table 21 show that the number of calves reared represents a little under 50 per cent. for all zones. It is not possible to say how many bull calves were fed but general advice from the judges was that the great majority of calves were heifers. If the milk producing figures are excluded (see above) the number of calves reared on the remainder producing cream represents 63 per cent. of the herd numbers. Thus it may be considered that ample reserve for replenishing herds exists on these farms. Further that there is considerable margin for sale or for the development of larger herds to use the gradually extending areas of pasture.

The largest proportion of calves reared was in Zone 2, where most competitors reared all calves with the exception of a few which were dropped late in the season. Mr. D. O. Briggs was the only competitor to rear a calf for each cow in the herd.

Mr. J. P. Norton in Zone 2 reared 62 calves from 64 cows and Mr. S. C. Maidment of Zone 4, 71 calves from 73 cows. On each of these farms a large number of pigs were raised also.



A modern milking shed. Denmark Research Station.

Pig Raising.—Pig raising is an essential and profitable adjunct to butterfat production. Hence any discussion of the efficiency of dairy farming should also have reference to this activity. During the recent war efforts were made successfully to stimulate production, but more recently there has been evidence of a considerable decline, which in view of the relatively high prices which are offering can only be explained by the disinclination of farmers to buy wheat for supplementing

the skim milk because it can be bought in quantity only in bulk and also because of the higher price at which it is available. Examination of the reports however while at first tending to support the contention of a decline, shows instead that excluding the milk producing farms, pig raising has not declined compared to the position disclosed in other Better Dairying Competitions.

In Table 21 is given a comparison of the ratio of sows to cows with other years.

TABLE 21

COMPARISON OF NUMBER OF COWS PER SOW.

Zone	Cows	Sows	Number of Cows per One Sow.					
			1948–1949	1935–1936	1934–1935	1933–1934	1932–1933	1931–1932
1. Coastal	608	1	608	22·8	23·6	34·5	....	....
2. Bunbury - Donnybrook	269	24	11·2	11·7	10·2	10·7	....	....
3. Busselton-Margaret River	230	25	9·2	6·2	6·9	15·9	....	....
4. Bridgetown	400	31	12·9	8·6	10·9	11·2	....	....
5. Manjimup - Northcliffe	161	9	48·0	9·7	11·6	10·6	....	....
7. South Coastal	286	25	11·4	....	8·4	12·3	....	....
All Zones	....	....	17·1	11·2	12·5	14·2	10·7	6·7
Butterfat farms only	....	....	10·3	....	....	....	....	....

The number of sows in Zone 1 was always lower than in the others and its inclusion in the figures intended to make the degree of which pig raising was carried on less than was actually the case where skim milk was available for feeding. On this occasion only one sow was kept in the whole of their zone.

Excluding the farms in Zone 1 and those in Zone 2 supplying milk to a cheese factory the ratio is 10·3 cows per sow.

However, the simple ratio of cows per sow may not always give a true picture of the pig fattening activities of farmers as some may sell pigs as weaners, others as baconers and with the same ratio of sows to cows there would naturally be considerable difference in the usage of skim milk.

To give some idea of the system followed by most farmers information was collected to show how the pigs were sold. As will be seen in Table 22 the great majority were fed to the baconer stage.

TABLE 22.

DISPOSAL OF PIGS.

Pigs Sold as	All Zones	Excluding Zone 1	Excluding All Milk Producing Farms*
Baconers	1,232	1,177	1,140
Porkers	44	44	444
Slips	12	12	12
Weaners	175	175	175
Choppers	10	10	10
Number of Cows	1,964	1,356	1,166

* Butterfat producing farms only.

This is pleasing as the ratio of 10·3 cows per sow is low compared to many suggestions which have been made regarding the number of sows which should be kept. This actually must depend on the stage at which the progeny is marketed.

However the number of pigs which could be fattened on most of the farms could be increased easily to the profit of the farm, by the use of more wheat. This would reduce the margin gained on each pig but increase the overall profit.

The average sales were one bacon pig for each cow milked after making allowance for porkers, slips and weaners.

It is suggested that the aim by all dairy farmers should be two bacon pigs per cow. That this is not an impossible objective is proved by the performances of the following farmers:—

J. P. Norton, Zone 2—56 cows ; 156 baconers.
J. Bashford, Zone 5—36 cows ; 42 baconers ; 30 porkers ; 48 weaners.
H. S. Moyes, Zone 4—31 cows ; 61 baconers ; 13 porkers.
Mrs. M. A. Crute, Zone 2—26 cows ; 54 baconers.

Cattle appreciate shade.

Some 19 years ago the Department of Agriculture after consultation with bacon owners and breeders recommended farmers to concentrate on the Berkshire and Tamworth breeds to procure pigs suitable for pork and bacon and for export.

This policy has been advocated since with a view to the standardisation of the type of pig used with the ultimate aim of improving quality.

The large White Breed also received approval although it was considered not so suitable for local trade owing to its later maturity. There is no question of its suitability for markets, including export, requiring large carcasses.

The breeds in use by competitors are shown in Table 23.

TABLE 23.

BREED OF SOWS.

Breed	Number of Sows*			Percentage		
	1948–1949	1935–1936	1934–1935	1948–1949	1935–1936	1934–1935
Berkshire	13	26	26	12·9	14	21
Berkshire × Tamworth	45	120	75	44·5	64	61
Tamworth	14	....	....	13·9	....	....
Large White	11	4	9	10·9	2	7
Others	18	38	14	17·8	20	11

* 14 breed not recorded.

It will be seen that there has been a decline even though small in the popularity of the Berkshires and Berkshire-Tamworth Cross. This is balanced from one point of view by the inclusion of 14 pure bred Tamworth sows. This however is not a good trend as the Berkshire-Tamworth and the pure Berkshires will provide carcasses superior to those from the pure Tamworths. The fact that the breed of 14 sows was not recorded could have an effect on the apparent popularity of the breeds, as disclosed by the figures.

There has been a strengthening in favour of the Large White, and the judicious use of these pigs, pure or as crosses with the Berkshire is likely to provide good quality carcasses.

The proportion of other breeds and crosses appears to be as for other years.

FARM MANAGEMENT.

Under this heading points are allotted for the layout of each property in respect to efficient use and convenience ; its sanitation in a general sense and in particular around and in the dairy building and finally for the manner in which farm records were kept. The scale of points as a whole can be accepted as a measure of overall farm management.

The trend towards improved layout, better buildings and facilities have been observed for some time while the manner in which accounts and other records are kept have been improved considerably in recent years.

Mr. A. L. Hamilton, Dairy Adviser, reporting on Zone 3 said " It was evident on most of the properties that thought has been given to the layout, and in two instances extensive rebuilding and improvement to sheds and yards were in progress. Points were lost in some cases through lack of conveniences in the appointments of the bails and milkrooms, although they complied in major respects with the minimum requirements under the model by-laws. The restricted supplies of building materials, particularly cement, and fencing wire have prevented extensive improvements in layout and conveniences."

The investigations of the Commonwealth Joint Dairy Costs Advisory Committee have shown that labour is the largest single item of cost in producing a pound of butterfat. Any improvement to give greater convenience or any labour saving device or equipment must therefore tend towards greater profit. In this regard the comments of Mr. K. W. Simes, Dairy Instructor and Judge of Zone 4 are of interest, " The

The main farm roadway, Denmark Research Station. Straight fence and yard lines and painted buildings are attractive.

winning farms are far larger than the average, yet their holdings are among the most highly developed in the Zone. The number of men employed on each, and the man-hours worked per annum would not exceed that of the average farm. Yet the results are superior."

SUMMARY OF LESSON WHICH MAY BE DRAWN FROM THE RESULTS.

1. *Fodder Conservation.*

(a) The aim of providing 2½ tons of hay per cow-unit or its equivalent in silage or summer crop has been proved desirable.

(b) The achievement of most competitors in this respect was disappointing although in no case was there evidence of poor condition in stock as a result. However, it was obvious that yields from the cows were lower than would have been the case had larger supplies been available.

(c) Planning of the conservation programme should be in advance of the actual harvesting season. This includes not only the preparation of paddocks for cutting but also arrangements for cutting, baling and carting.

(d) To provide the equivalent of 2½ tons of hay per cow-unit, it is suggested that hay, silage and green fodder be available. This could be provided by conserving. 1½ tons of hay and 1½ tons of silage per cow plus ¼ acre of green fodder or 1½ tons hay and 3 tons of silage per cow-unit.

Lucerne is a crop which merits more attention particularly where irrigation is possible for spring planting.

(e) Early cultivation is essential for summer fodder crops, with planting at times to give a continuous supply of green material to supplement the reserves of hay and silage.

(f) Owing to the disinclination of farmers to plant sufficient summer fodders because of the labour involved in cutting and feeding, their attention could be given to crops such as Sudan grass, Japanese Millets and Sacchaline which can be grazed.

2. *Pastures.*

(a) Pastures can be improved by the incorporation of high yielding grass species with Subterranean clover.

(b) Perennial species where possible will extend the grazing periods.

(c) Cultivation of winter pastures early in the autumn is profitable.

(d) Chain harrowing to spread droppings makes the paddocks more even in growth and palatable to stock.

(e) Top-dressing at two cwt per acre is the optimum plus copper sulphate in areas where it is proved necessary.

(f) Liquid manure (E. Rosher) has proved advantageous.

(g) Carrying capacity is best adjusted to 4 to 4½ acres per cow.

(h) Overstocking will not increase profit.

3. *Dairy Herd.*

(a) Good quality stock are the best and enable higher output per labour unit.

(b) Lactations generally were short ; due principally to the lack of provision of feed during summer months.

(c) Early calving is practised by most except those in the whole milk areas.

(d) Most competitors appreciate the value of Standard bulls but more attention is needed to the selection of proved bulls.

4. *Utilisation of Skim Milk.*

(a) Skim milk is too valuable to waste.

(b) It should be used to rear heifers for herd replacement, with a surplus for sale.

(c) After supplying needs of calves the surplus of skim milk should be used for feeding pigs.

5. *Pigs.*

(a) Although the number of pigs fattened on butterfat farms was equal to other competitions, the objective of two bacon pigs per cow should be adopted.

(b) Breeding young pigs generally is more profitable than buying weaners or stores.

(c) The Berkshire, the Berkshire-Tamworth Cross, and the Large White provide suitable carcasses and are economical growers.

SUMMARY OF DATA.

Number of competitors	53.
Average size of herds	37.
Average Area Pasture per farm	163.5 acres.
Average area per cow	4.4 acres.
Average area per head	2.2 acres.
Average yield per cow	233 lbs. butterfat.
Average yield per acre	52.6 lbs. butterfat.
Fodder Conserved per Cow.	
Hay	1.2 tons.
Silage	0.28 tons.
Green Crops	0.1 acres.
Equivalent as Hay	1.55 tons.
Pigs.	
Ratio cows to sows—	
All Zones	171 : 1
Butterfat farms	10.3 : 1
Number of bacon pigs sold per annum—	
Per cow	1.0
Per sow	10.4

ANALYSES OF FEEDING STUFFS

RESULTS of Analyses of samples of Feeding Stuffs taken under the Feeding Stuffs Act, 1928-1946.

(Published under section 9 of the Act.)

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid. P_2O_5.	Lime. Ca.	Others.	
	Anchorage Butchers. Ltd.	%	%	%	%	%	%	%	%
	" Coogee " Meatmeal—								
	Registered Analysis	†36.9	*18.6	*1.3	*1.0	*12.73	11.43	....	....
28-9-48	Sample Analysis	42.5	13.2	0.9	0.45	11.1	9 98	....	....
	Barrow Linton & Co.								
	" Dukko " Fattening Mash—								
	Registered Analysis	†10.0	†4.0	*4.0	*1.0	....	3.0	....	....
17-9-48	Sample Analysis	14.7	4.6	5.2	0.92	....	3.04	....	....
	" Excelsior " Meat and Bone Meal—								
	Registered Analysis	†38.0	*15.0	*1.5	....	....	....	....	....
17-9-48	Sample Analysis	39.8	13.6	1.6	....	....	....	....	....
	W. R. & N. N. Clarke.								
	" S.M.P." Meat and Bonemeal—								
	Registered Analysis	†50·0	*13·0	*2·0	....	....	....	....	....
20-1-49	Sample Analysis	50·0	11·7	2·5	....	....	....	....	....
	Daivd Gray & Co., Pty. Ltd.								
	" Western " " A1 " Laying Mash—								
	Registered Analysis	†14·0	†3·0	*5·0	....	2·0	0·5	....	....
12-1-49	Sample Analysis	14·2	3·0	5·1	....	1·08	0·46	....	....
	" Western " Laying Mash "B"—								
	Registered Analysis	†12·5	†3·0	*5·0	....	2·0	0·5	....	....
12-1-49	Sample Analysis	11·8	2·9	4·7	....	0·43	0·07	....	....
	" Western " Pullet Food—								
	Registered Analysis	†25·0	†7·0	*5·0	....	1·0	0·5	....	....
25-10-48	Sample Analysis	20·2	4·6	2·6	....	4·24	10·5	....	....
	" Western " Chickbuilder—								
	Registered Analysis	†14·0	†4·0	*4·5	....	2·0	0·5	....	....
22-11-48	Sample Analysis	13·4	4·7	5·5	....	1·95	0·6	....	....
	Hagnes & Clements.								
	" H & C " Chickfood—								
	Registered Analysis	†9.0	†1.5	*4.5	....	....	3.0	....	....
2-9-48	Sample Analysis	9.0	1.7	2.8	....	....	3.24	....	....
	J. Kitchen & Sons Pty., Ltd.								
	" Apollo " Bone and Meatmeal—								
	Registered Analysis	†40·0	*11·0	*2·5	....	14·0	....	....	....
6-12-48	Sample Analysis	45·5	6·5	1·2	....	15·3	....	....	....
	Kraft Walker Cheese Co.								
	" Krafco " Dried Whey Powder.—								
	Registered Analysis	†10.0	†0.5	*Nil	Lactose 68.0	1.0	0.7	....	....
25-10-48	Sample Analysis	13.0	0.2	0.1	68.2	0.96	0.72	....	....
	W. H. Milne & Co.								
	"Millers" Laying Mash No. 1.—				Sodium Chlor.				
	Registered Analysis	†14.0	† 4.0	* 5.50	* 1.5	* 2.0	* 3.0	....	....
26-10-48	Sample Analysis	15.3	4.6	4.8	1.32	1.64	1.51	....	....
	" Millers " Chickstarter.—								
	Registered Analysis	15.0	† 4.0	* 5.5	* 1.0	* 2.0	* 2.5	....	....
26-10-48	Sample Analysis	†15.1	4.3	3.3	0.89	2.07	2.59	....	....
	James E. Shaw.								
	" Champion " Meatmeal—								
	Registered Analysis	†50·0	*15·0	*5·0	....	....	....	....	....
17-1-49	Sample Analysis	51·7	12·2	2·2	....	....	....	....	....
	South-West Dairy Farmers Co-op.								
	" Sunnywest " Dried Buttermilk								
	Registered Analysis	†32.1	†5.7	....	....	....	....	....	....
28-9-48	Sample Analysis	31.7	7 9	....	....	....	....	....	....
	W. Thomas & Co. (W.A.), Ltd.								
	" Thomas " Chickgrower—								
	Registered Analysis	†13·5	†2·5	*6·0	*1·25	....	*3·75	....	....
17-1-49	Sample Analysis	15·2	3·2	4·8	1·41	....	2·31	....	....

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS—

continued.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime. Ca.	Others.	
		%	%	%	%	%	%	%	%
	"Thomas" Laying Mash No. 1—								
	Registered Analysis	†14·0	†2·5	*6·0	*1·5	....	*3·75	....	....
17-1-49	Sample Analysis	14·8	3·6	5·4	1·56	....	2·35	....	....
	"Thomas" Laying Mash No. 2—								
	Registered Analysis	11·0	2·5	6·5	1·5	....	3·75	....	....
12-1-49	Sample Analysis	12·6	3·0	5·6	1·32	....	2·43	....	....
	"Thomas" Quicklay—								
	Registered Analysis	†35·0	*12·5	*4·0	*3·0	....	*15·0	....	....
18-1-49	Sample Analysis	40·2	12·3	1·6	5·79	....	11·3	....	....
	"Thomas" Sweet Dairy Food—								
	Registered Analysis	†11·5	†1·5	*8·5	*1·75	....	*4·0	....	....
12-1-49	Sample Analysis	12·9	2·8	7·3	1·75	....	1·90	....	....
	"Thomas" Chickgrower—								
	Registered Analysis	†13.5	†2.5	*6.0	*1.25	....	3.75	....	....
12-8-48	Sample Analysis	15.8	4.02	4.5	1.32	....	2.6	....	....
	"Thomas" Chickstarter—								
	Registered Analysis	†14.5	†2.5	*6.0	*1.25	....	3.75	....	....
12-8-48	Sample Analysis	16.7	4.7	4.9	1.52	....	1.9	....	....
	"Thomas" Eggmilk—								
	Registered Analysis	†15.0	†5.0	*4.0	*3.0	....	*15.0	....	....
12-8-48	Sample Analysis	19.4	4.9	2.3	2.92	....	4.6	....	....
	"Branato" Wheatmeal—								
	Registered Analysis	†8.0	....	*9.0	....	....	....	....	....
2-9-48	Sample Analysis	9.8	....	2.8	....	....	....	....	....
	"N.A." Sterilised Bone Grit Meal.—								
	Registered Analysis	†20.0	....	....	* 0.2	†22.0	†26.0	....	....
20-10-48	Sample Analysis	20.4	....	....	0.12	22.5	26.2	....	....
	"Pollato" Stock Meal.—								
	Registered Analysis	† 8.0	....	* 9.0	....	....	....	....	....
21-10-48	Sample Analysis	7.8	....	10.0	....	....	....	....	....
	"Thomas" Pig Grower—								
	Registered Analysis	†12.0	†1.5	*6.0	1.25	....	3.75	....	....
27-9-48	Sample Analysis	13.8	2.4	3.7	1.21	....	2.86	....	....
	Tropical Traders, Ltd.								
	"Evelyn" Calf Food—							Sulphur	
	Registered Analysis	†10.5	†4.77	*3.86	*3.0	....	....	*0.75	....
11-8-48	Sample Analysis	9.4	2.8	2.3	3.1	....	....	1.3	....
	"Evelyn" Horsefood—								
	Registered Analysis	†12.6	†5.7	*7.14	*6.0	0.9	1.1	*1.84	....
2-9-48	Sample Analysis	12.9	4.3	4.3	5.8	0.94	1.0	2.6	....
	W.A. Meat Export Works.								
	"W.A.M.E." Meatmeal—								
	Registered Analysis	†45·0	*13·0	*2·0	....	....	....	....	....
20-1-49	Sample Analysis	50·4	11·5	2·4	....	....	....	....	....
	Westralian Farmers Co-op., Ltd.								
	"Wesfarmers" Chick Mash "A"—								
	Registered Analysis	†15.0	†4.0	*7.0	Trace	....	0.3	....	....
11-8-48	Sample Analysis	15.9	4.9	4.1	....	....	1.5	....	....
	"Wesfarmers" Chickmash "B"—								
	Registered Analysis	†14.0	†4.0	*7.0	0.5	....	0.5	....	....
10-8-48	Sample Analysis	15.5	4.4	4.1	0.73	....	1.2	....	....
	"Wesfarmers" Growers Mash—								
	Registered Analysis	†13.0	†4.0	*7.5	0.5	....	0.7	....	....
10-8-48	Sample Analysis	14.2	3.7	4.9	0.88	....	1.3	....	....
	"Red Comb" Laying Pellets, No. 2—								
	Registered Analysis	†11.0	†3.0	*7.0	0.5	....	0.8	....	....
1-8-48	Sample Analysis	12.2	2.9	3.8	0.69	....	1.2	....	....
	"Wesfarmers" Laying Mash No. 2—								
	Registered Analysis	†11.0	†3.0	*7.0	0.5	....	0.8	....	....
27-9-48	Sample Analysis	11.7	2.2	4.6	0.70	....	1.13	....	....
	Wesfarmers" Chickmash "B"—								
	Registered Analysis	†14·0	†4·0	*7·0	0·5	....	0·5	....	....
27-1-49	Sample Analysis	17·0	4·6	4·6	1·11	....	1·38	....	....

* Maximum. † Minimum.

ANALYSES OF FEEDING STUFFS—
continued.

Date Sample taken.	Firm and Brand.	Crude Protein.	Crude Fat.	Crude Fibre.	Sodium Chlor.	Phosphoric Acid P_2O_5.	Lime, Ca.	Others.	
		%	%	%	%	%	%	%	%
	"Red Comb" Chick Pellets "A"—								
	Registered Analysis	†15·0	†4·0	*7·0	...	....	0·3	....	....
27–1–49	Sample Analysis	15·6	4·8	4·0	....	....	1·16	....	....
	"Red Comb" Chick Pellets "B"—								
	Registered Analysis	†14·0	†4·0	*7·0	0·5	....	0·5	....	
27–1–49	Sample Analysis	17·5	4·8	4·6	0·32	....	1·48	....	....
	"Wesfarmers" Growers Mash—								....
	Registered Analysis	†13·0	†4·0	*7·5	0·5	....	0·7	....	
24–11–48	Sample Analysis	14·5	3·2	4·1	0·72	....	1·5	....	....
	"Red Comb" Growers Pellets—								....
	Registered Analysis	†13·0	†4·0	*7·5	0·5	....	0·7	....	
23–11–48	Sample Analysis	14·1	4·4	4·7	0·74	....	0·8	....	....
	"Red Comb" Growers Pellets—								....
	Registered Analysis	†13·0	†4·0	*7·5	0·5	....	0·7	....	
26–1–49	Sample Analysis	13·9	3·7	4·4	1·07	....	1·16	....	....
	"Wesfarmers" Laying Mash No. 1—								....
	Registered Analysis	†14·0	†4·0	*7·0	0·5	....	1·0	....	
22–11–48	Sample Analysis	13·5	3·6	4·7	0·69	....	1·9	....	....
	"Red Comb" Laying Pellets No. 1—								....
	Registered Analysis	†14·0	†4·0	*7·0	0·5	....	0·8	....	
23–11–48	Sample Analysis	13·4	3·1	3·8	0·52	....	1·8	....	....
	"Red Comb" Laying Pellets No. 1—								....
	Registered Analysis	†14·0	†4·0	*7·0	0·5	....	0·8	....	
26–1–49	Sample Analysis	14·1	4·0	4·2	0·60	....	2·0	....	....
	"Red Comb" Laying Pellets No. 2—								....
	Registered Analysis	†11·0	†3·0	*7·0	0·5	....	0·8	....	
24–11–48	Sample Analysis	11·8	3·1	4·2	0·64	....	1·4	....	....
	"Wesfarmers" Protein Meal "B"—								....
	Registered Analysis	†35·0	*10·0	*4·5	....	....	5·0	....	
18–1–49	Sample Analysis	35·1	11·2	2·0	....	....	8·27	....	....
	"Wesfarmers" Sweetened Dairy Meal—								....
	Registered Analysis	†11·0	†2·5	*6·0	1·0	....	0·7	....	
2–2–49	Sample Analysis	9·20	2·6	10·5	1·28	....	1·5	....	....
									....
	Wrights, Ltd.								
	"Wrights Meatmeal—								
	Registered Analysis	†40.0	*11.0	*1.5	....	14.0	....	....	....
27–9–48	Sample Analysis	45.0	8.7	0.4	....	14.6	....	....	....
	"Pannifex" Poultry Pusher.—								
	Registered Analysis	†32.0	† 7.0	* 8.0	....	....	....	....	....
20–10–48	Sample Analysis	32.8	8.1	8.2	....	....	....	....	....
	R. B. Young.								
	"Morlay" Growing Mash—								
	Registered Analysis	†12·5	†3·0	*5·5	*1·5	*4·0	†2·5	....	....
19–1–49	Sample Analysis	13·3	3·8	4·2	1·11	4·26	4·24	....	....
	"Morlay" Fattening Mash "D"—								
	Registered Analysis	†10·5	†3·0	*5·0	1·5	3·5	2·0	....	....
19–1–49	Sample Analysis	12·7	3·6	4·1	1·13	3·86	3·77	....	....
	"Morlay" Laying Mash.—								
	Registered Analysis	†14.0	† 3.0	* 5.5	* 1.5	* 3.5	† 2.5	....	....
27–10–48	Sample Analysis	15.1	4.4	4.8	1.17	2.48	2.22	....	....
	"Morlay" Laying All Mash.—								
	Registered Analysis	†13.0	† 3.0	* 6.0	* 1.5	* 4.0	† 2.5	....	....
27–10–48	Sample Analysis	15.7	4.8	5.2	1.25	2.34	2.11	....	....

* Maximum. † Minimum.

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